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ABSTRACT

The first part of this report discusses the technical capabilities and evaluates the usefulness of audio, video, and computer-based teleconferencing to date. In addition, face-to-face conferencing is compared to teleconferencing. The second part presents eight scenarios--two for each medium--in which the same cast of characters communicates bilingually in an international meeting about an impending drought in the imaginary country Camelia. The purpose of the scenarios is to illustrate both effective and ineffective uses of audio, video, and computer teleconferencing and face-to-face communication in small groups. After each pair of scenarios, an analysis traces the links between events in the scenarios and the medium strengths and weaknesses which inspired them. Included are a summary of social evaluations of teleconferencing, a catalog of representative systems for teleconferencing, and a bibliography. (LL)

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The Camelia Report

A Study of Technical Alternatives and Social Choices in Teleconferencing

Robert Johansen Jacques Vallee
Kathleen Spangler
R. Garry Shirts, Consultant

INSTITUTE FOR THE FUTURE

R-37

A report of research conducted under a grant from the Charles F. Kettering Foundation

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THE CAMELIA REPORT

A Study of Technical Alternatives and Social Choices in Teleconferencing

Robert Johansen Jacques Vallee
Kathleen Spangler
R. Garry Shirts, Consultant

A Report from
The Intermedia Project

Sponsored by
The Charles F. Kettering Foundation

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WHAT IS CAMELIA?

A SUMMARY

In an imaginary world of 1985, there is an imaginary country we call Camelia. We created Camelia to explore the long-term potential of teleconferencing for a cross-cultural, small-group communication situation. In our future world, Camelia faces an impending drought, and several organizations could help. But there is a communication problem here: no one knows exactly how bad conditions are likely to be or just how much relief the various organizations will be able to provide. And those who could answer these questions haven't been talking to each other.

The problem is representative of many communications situations today. But there is an important difference, too. In 1985, when the economic minister of Camelia wants to confer with the chairman of an international food consortium and a representative of the U.S. government, the discussions may not take place in person. Instead, the three of them could sit in front of small television cameras, type on computer terminals, or use audio channels to work with each other or with other organizations in any part of the world. The technology for such teleconferencing already exists: over 40 video, audio, and computer-based teleconferencing systems are in limited use today.

However, the days are gone when the technical feasibility of an idea guaranteed that it would become a market reality. Our society is becoming sophisticated enough to refrain from developing technologies it does not want--or at least to delay their introduction and influence their form. Besides, the human factors of teleconferencing are so complex that the transition from the laboratory to the real world is quite delicate. The initial market failure of the Picturephone® , a service that industry regarded as a likely success, has taught forecasters in this field a serious lesson. It is not enough to find a way to send a picture or a voice or written words from "here" to "there." One must also make judgments

about why the information is sent, when, how often, at what level within an organization, and with what cultural backdrop. Any mistake in this analysis will mean a mismatch between the technology and the user community it intends to serve.

It is our feeling that no appraisal of teleconferencing can stand solely on the technological potential we see today. As interested researchers in Europe remarked: "Don't tell us about how the technology works. We are certain that those things *can* be developed. What we want to know is *what they will do to the way we think* and to the things we can think about."

Over the past decade, more than a hundred studies have examined the *social* effects of new teleconferencing media. From those studies, the following profiles of each medium emerge:

Video teleconferencing. Video teleconferencing has a rich potential for communication which cannot be reduced to words or print. But it also has some pitfalls. One is the "Hollywood syndrome"--the association of video teleconferencing with movies and television. This association can make group members self-conscious and encourages a "presentation" style of communication; in the extreme, it might lead to deliberate deception. Also, video teleconferencing has not yet been demonstrated as an effective medium for meetings among strangers. Furthermore, while video meetings tend to have an "unorganized formality," careful preplanning by the group leader--a regular schedule of not-too-long meetings--seems necessary.

Computer-based teleconferencing. Computer conferencing is print-based communication, using typewriter terminals and a computer network to link groups together. Its major advantage over other teleconferencing media is its flexibility of participation times. Unfortunately, since there is no firm schedule for a computer conference, participation may be irregular, especially if the need to communicate is not obvious. When the need to communicate does exist, this print-based medium provides a written record which can improve management of technical information. Here

again, though, the capabilities of the medium can be abused: the value of information can be overemphasized at the expense of interpersonal communication. For some, the printed word will also be frustrating since, in computer conferencing, even the best orator cannot demand the group's attention. For others--particularly shy participants--it may encourage more equal participation.

Audio teleconferencing. In audio teleconferencing, many of the non-verbal signals which are assumed in face-to-face meetings are missing. Such lack of visual information does not necessarily inhibit communication; for sensitive communications situations, such as negotiation, it may even have subtle advantages. Nevertheless, there are some organizational problems. For example, speaker recognition and order of speaking are difficult; if participants have not met before, this problem is exaggerated, and shy people may not feel free to join in the discussion. Also, the group is likely to spend a lot of time in self-organization. For planning an audio teleconference, three keywords seem very important: brevity, regularity, and simplicity.

Face-to-face conferencing. Face-to-face communication is often the unquestioned standard for comparison with new media. However, face-to-face conferences have their own advantages and disadvantages. Most people respond positively to face-to-face meetings; it is a "friendly" medium. Also, face-to-face appears to be superior for complex tasks, such as those involving conflict and negotiation. It is a fine medium for a natural orator, but it does not guarantee that everyone will get an equal hearing. Also, large amounts of information may be overwhelming in face-to-face situations. Time seems to be a critical factor for this medium: the intensity of communication which creates a feeling of intimacy can also be perceived as pressure; and in a short meeting with too many tasks, this pressure can destroy the communication. Face-to-face will probably feel more "natural" than electronic media, but it will not necessarily be the most effective means of communication.

The Camelia Report is both a synthesis and a probe. It synthesizes the technical capabilities and social evaluations of audio, video, and computer-based teleconferencing. The first section, "Teleconferencing Today," briefly summarizes the state of the art in teleconferencing technology. (Reference materials provide detailed information later in the report.) Then, using this state-of-the-art overview as a starting point, the second section of the report introduces the Camelian situation to probe the meaning of current evaluations of teleconferencing in a future setting where such technologies will be casually available. The guiding questions in this probe are:

- How can we make intelligent choices among teleconferencing media once they are offered to us?
- How can we learn to use them effectively?
- How can we improve our understanding of the social consequences of new teleconferencing media?

To approach these three questions, we have assumed that, while the fundamental features of teleconferencing media are likely to remain constant, the current form and usage patterns result from transient phenomena. The technology will eventually find its own level, but its social effects will not become observable for 5, 10, or 15 years. In order to study these effects, we must somehow compress this waiting period. We have begun by using the current evaluations as a bridge to a world of 1985, where the Camelians are facing drought. A private foundation is attempting to promote better communication among those who have a stake in the Camelian problem. We show both effective and ineffective applications of each medium for this situation. The result is eight scenarios in which the same cast of characters communicates under the same general situation in what amounts to a sociocultural sensitivity analysis.

The skeleton on which the scenarios are built is a summary of the "strengths" and "weaknesses" of each medium, as found in the social evaluations to date. These strengths and weaknesses are included, together with a classification of studies, as reference materials. Also included is a catalog of representative teleconferencing systems and a bibliography.

The focus of the Camelia scenarios is small group communication. But at least as important will be organizational and societal issues related to the use of teleconferencing. Such research is only beginning to occur, but will be necessary to place small group perspectives in the context of organizational and social change.

Our own plans call for the translation of the scenarios into a tutorial for new users of teleconferencing systems. We hope that this exercise will be used internationally to explore possible styles of teleconferencing, social barriers to its use, problems of cross-cultural communication via teleconferences, and other related issues. While the focus of our effort is on social evaluation of teleconferencing systems, we conclude this phase of our study with a strong realization that no medium can be evaluated solely in terms of strengths and weaknesses. The mysteries and art of human communication remain obvious, no matter what medium is used. Teleconferencing media introduce a new set of potentials and problems, but they don't provide instant remedies to the complexity of the communication process.

I. TELECONFERENCING TODAY: AN OVERVIEW

Interest in teleconferencing has grown steadily in recent years. Research in this field initially focused on technological issues. Then, in 1960, the Institute for Defense Analyses sponsored a major study of teleconferencing as an aid for international negotiations. This work was not distributed broadly, however, and there was little teleconferencing research in the late 1960s. In 1970, the Communications Studies Group began work in London under the direction of Alex Reid (and later, under Martin Elton). This group has proven to be a prime catalyst for interest in teleconferencing systems and their social effects.[2] Its work has complemented ongoing research in Canada, Australia, Sweden, and the United States. Most recently, a systematic catalog of teleconferencing systems (Hough, 1976) has identified 37 different systems intended specifically for small group communication, and a new journal, with a strong focus on teleconferencing research, has been introduced.[3] The phase of commercial application of teleconferencing systems is just beginning.

Each teleconferencing medium--video, audio, and computer conferencing--has its own history and its own fundamental characteristics which influence its potential applications. While current systems are changing rapidly, these fundamental features are likely to remain. "Bells and whistles" may be added, and the media will almost certainly become more broadly accessible. But no major technological breakthroughs are likely to change their basic functions, which are described below.

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[2]The work of the Communications Studies Group is discussed in detail in a book by John Short, Ederyn Williams, and Bruce Christie, called *The Social Psychology of Telecommunications* (John Wiley, 1976). Many of the CSG reports are listed in the bibliography of this report; reports issued before 1973 can be obtained from: Post Office Telecommunications, TMk 3.3.1, Room 120, 2-12 Gresham Street, London EC2V 7AG, England. Post-1973 reports are available from Communications Studies and Planning, 56/60 Hallam Street, London W1N 5LH.

[3]*Telecommunications Policy*, IPC Business Press, Ltd., 205 East 42nd Street, New York, New York 10017.

VIDEO TELECONFERENCING

In his 1971 novel *Diabolus*, David Saint John has an Intelligence agent discussing a point in the office of the CIA station chief in Paris:

> Peter finished his coffee and looked around. Evans was sitting quietly next to the drape-hung wall. There was no sound in the insulated room, but Peter knew they were shielded by an electronic barrier, impenetrable to any form of bugging. In one corner stood the TV screen and camera that permitted conferences with the Director via satellite.

While such technology is more casually available in spy novels than the real world, video teleconferencing is already a technical reality. The usually unquestioned assumption behind video has been that the closer a medium can come to face-to-face communication the better. Engineers struggle to make video images lifelike in size and in quality. Thus, video systems are becoming increasingly sophisticated.

Some Promising Systems

A system in use at the Energy Research and Development Administration (ERDA) is representative of the best in current equipment. It connects Germantown, Maryland, with Washington, DC, a distance of 20 miles. The system transmits black-and-white images of conference groups, with up to six participants in each group. In each room, there are several cameras for self-view, overview, and close-ups. A tripod camera is used for blackboard shots, and an overhead projector serves to show written documents. The cameras are voice-switched with manual override by buttons in front of the center chair. The cost of the system is $4,800 per month: $1,440 per location and $2,000 for the lines. The installation is "up" 24 hours a day and requires seven or eight conferences per month with five people at each end to justify its cost. Its use to date seems to meet this requirement.

If people at more than two locations want to conference, video presents some problems since it is difficult to show all participants on-screen simultaneously. Probably the most successful multisite system is operated by the Metropolitan Regional Council in New York City. Headquartered in the World Trade Center in Manhattan, this system has nine studios in county seats around the city. All are equipped with television cameras, requiring

an operator at each site. A case study evaluation performed by RAND in 1974 concluded that the system had been well received and was serving its purpose of facilitating government interaction. There were some technical problems, such as transmission failures and the inability of more than one person to speak at a time, but these were overcome by later improvements. The system has been operational since January 1974 and is used primarily for continuing education, personnel management, and purchasing. The operating cost for the facility was about $275,000 in the year 1974, according to the RAND report.

An Expensive Way to Meet

A "live" video image is very expensive. It requires the transmission of a large amount of information, and this information must constantly be revised to allow for movement. Thus, video is referred to as a "wide-band" communications medium: the bandwidth (size of the signal carrier) must be very large in order to send all this visual information continuously. Conversely, a facsimile system which sends photocopies is a "narrow-band" medium because information can be sent more slowly (usually three to four minutes per page) than is possible for a "live" video image.

The costs associated with the bandwidth required by video are formidable. The figures are difficult to estimate, but, at current rates in the United States, video teleconferencing is about five times as expensive as audio teleconferencing over comparable distances (Panko, Hough, and Pye, 1976). Even this figure seems optimistic because rate structures for video are still experimental. The video teleconferencing system between Sydney and Melbourne, Australia, has a real cost of about $400 per hour of usage. A comparable figure is estimated for the Japanese NTT system, connecting Tokyo with Osaka. The Picturephone® Meeting Service is currently available at experimental rates of $6.50 per minute from San Francisco to New York or Washington, $4.50 from Chicago to New York, $3.50 from Chicago to Washington, and $2.50 from New York to Washington. Such figures seem to be obvious inhibitors of usage, though they may still compare favorably with

travel costs.[4] Also, the potential for substantial cost reductions in video teleconferencing is uncertain. The key sources of hope are video compression techniques, optical fibre signal transmission, or other transmission innovations. While none of these possibilities promises immediate cost reductions, substantial cost reduction seems likely over a longer time span.

Some Psychological Barriers, Too

Such high costs, coupled with unavoidable psychological reactions to the television cameras, have led some researchers to question the long-term viability of video conferencing. Marketability of the technology appears to depend more on psychological factors than on engineering. The major handicaps are the need to schedule the use of the studios and to travel to some central facility to use the system; other negative considerations may be skepticism regarding confidentiality, as well as discomfort with the studio atmosphere and the feeling of being surrounded with "gadgets."

In 1985 . . .

As we project this technology to the 1985 horizon, we can assume that it will find its own level within the tasks that can be best served by video. Engineering considerations make it possible to envision full-color television networks which could link a number of separate locations. Each unit would be portable (thus eliminating the need to travel to a central studio) and could be installed temporarily on a rental basis. A split-screen arrangement would be possible, as would a close-up view of each speaker. The screens might be large and flat. Written documents would be sent electronically and a high-quality audio capability would parallel the video signal.

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[4] It should be noted here that even such high costs may not be impediments to use of video. Interviews with Australian users, for instance, indicated that the costs were considered reasonable. Business clients saw cost as no problem, while government users saw cost as a bureaucratic problem--video teleconferencing didn't fit their budget categories. See Susan Ellis, Vince McKay, and Michael Robinson, *Follow-Up Study of Users of the Melbourne-Sydney Confravision Facility*, Swinburne Institute of Technology, Australia, 1976. The costs of the Australian system, however, are below the actual cost for a self-supporting system.

Figure 1. A Picturephone® Meeting

COMPUTER TELECONFERENCING

It is ironic that some of the simplest ideas can only be put into practice when a very complex level of development has been reached in a related field. The availability of electronic memories could have permitted the establishment of networks of teletypes many years ago. Yet, such print-based conferencing only developed when casual access to terminals, powerful time-sharing systems, and text editors was made possible by the advances of computer science in the late 1960s.

A Hybrid Medium

Computer conferencing is a hybrid medium, borrowing its terminology from computer science although its purpose, culture, and evaluation strategies all come from the field of communications. This dual quality creates

unusual identity crises for the designers and the users of the medium; it also generates a dilemma for the evaluators and those who are concerned with regulatory implications. The designers of such systems find it difficult to win supporters among computer scientists, who view their work as simplistic because they are not impressed by the use of a processing machine to send messages. Similarly, communications experts, who lack a feeling for the genuine power of the computer, ask: "Why can't we do the same thing with a telephone or with TELEX?"

The answer is rather simple. Computer conferencing offers group communication irrespective of time or space, and it is generally less expensive than the telephone and TELEX once the terminal itself (an increasingly common device) is amortized. For example, the PLANET system, which is used in several projects at NASA and the U.S. Geological Survey, costs only about a quarter per minute--the price of a phone call from San Francisco to Denver. Systems based on dedicated machines will cost even less in just a few years. Terminals rent from $100 to $150 per month, with costs going down. Murray Turoff (1975b) has suggested that the cost of computer conferencing will be about $1 per hour for computing costs by 1980. While such a forecast appears to be optimistic, it seems safe to assume that the medium will not be expensive to operate by the mid-1980s--perhaps even less expensive than audio teleconferencing.

From Forecasting to Communicating

Computer conferencing developed out of a user community with very specific needs: forecasting and policy formulation through "expert" interaction. Today, however, computer conferencing is not restricted to experts and can involve a wide range of print-based communication activities. Users type their messages to other "conference participants" on standard computer terminals, usually linked by telephone to a computer network. They receive printed messages at their terminals each time they join a "computer activity." Such activities typically involve 3 to 25 people, though they all do not have to be present simultaneously. In fact, one of the most attractive features of computer conferencing is that all participants can come in at their own convenience, see what has happened since

they were last present, make whatever responses are appropriate, and leave. Between sessions, they may check their libraries, draft responses, reflect on solutions to current problems, or talk to others without fear of being either disruptive or rude as they would be in face-to-face meetings. Also, computer conferencing can bridge easily into other computer resources such as data analysis packages, data bases, or models. In short, computer conferencing is a medium that each participant uses only when he or she chooses.

On the other hand, computer conferencing is the least "natural" of the teleconferencing media. Users must type their messages and often don't have the advantage of immediate feedback. Also, because the medium operates solely through the written word, many visual cues and even voice intonation--which serve as guides in other communication situations--are lacking in computer conferences.

Several Styles of Conferencing

To date, various styles of computer conferencing have been observed. One of the most common, for example, is the "notepad" style; here, participants use the medium with little structure or interaction to track common areas of interest. The "seminar" style is also common; it focuses on one topic for a defined period of time with both "synchronous" and "asynchronous" interaction. A similar, but more complex style is the "assembly," with discussion of multiple topics structured by the medium. A fourth style might be labeled "the encounter" since it is dominantly synchronous with intense interaction over a period of several hours. Finally, computer conferencing can be structured to administer questionnaires or voting. While these five styles probably don't represent the range of all *possible* styles for using this medium, they do suggest some of the variations which are possible.

Power or Simplicity?

Computer conferencing means different things to different people, and there is a variety of different systems currently available or in testing

stages. One can, however, identify the basic elements of group communication through a computer as distinct from other existing computer services such as text editors, data bases, or journal systems. At present, some systems (such as the NLS system at SRI or the Electronic Information Exchange System at the New Jersey Institute of Technology) combine computer-based communications with other computer services to form a complex and powerful package. In contrast, other systems (such as the PLANET computer conferencing system) focus on providing only a nucleus of functions for group communication through a computer. The issue here is power vs. simplicity, and there are arguments on both sides. Actually, these two approaches can both be fruitful; they may simply be aimed at different user populations and task environments.

In 1985 . . .

When we extrapolate to the 1985 time horizon, we assume that much of this conflict in approach would be resolved. High-quality, low-cost terminals would be widely available. A reliable international time-sharing network, with satellite transmission, would provide computer access to even remote countries. Also, the design of computer conferencing systems would reflect a greater concern for--and understanding of--human factors. Finally, groups using this medium would have online access to data and mathematical models.

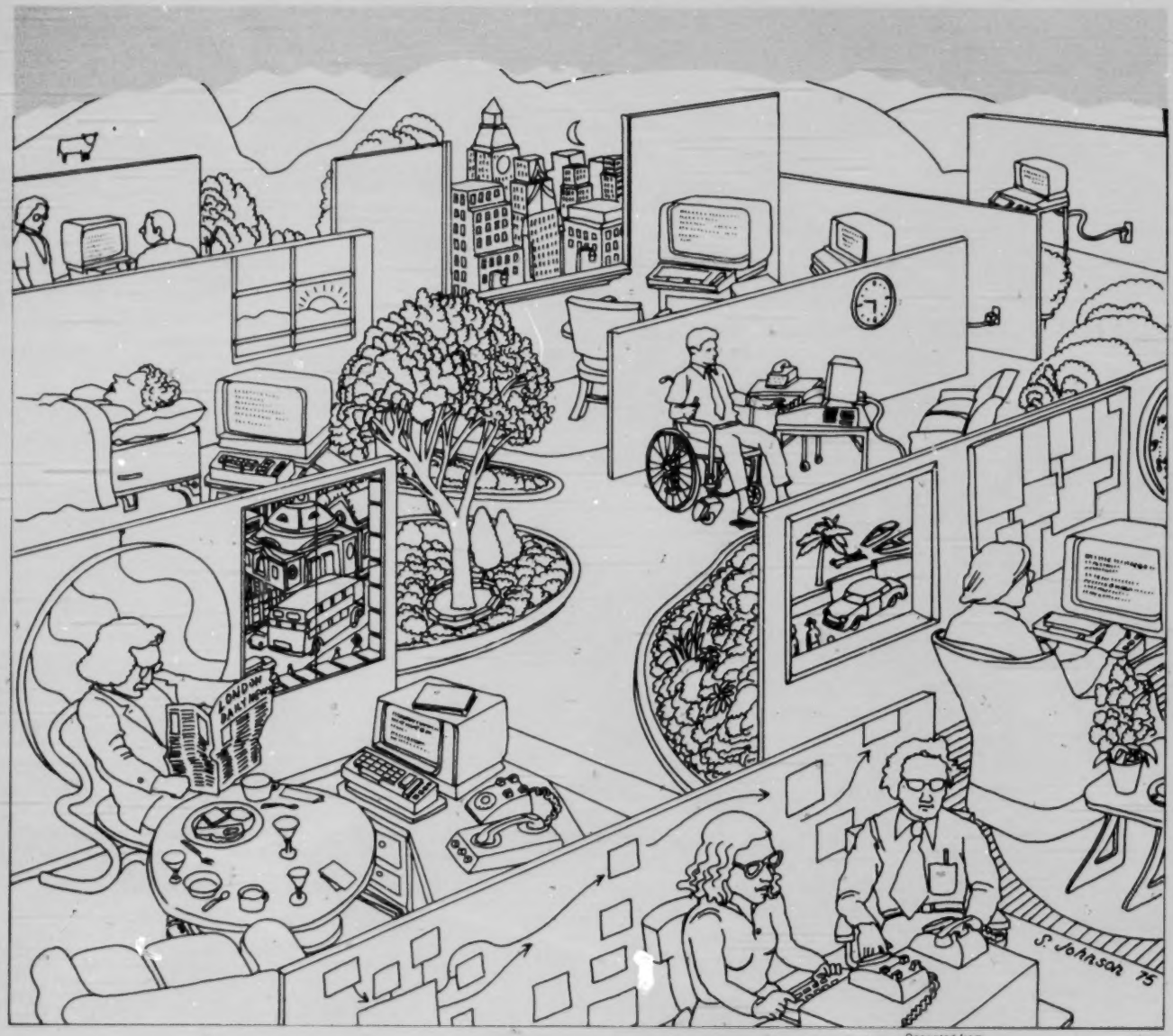

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Figure 2. Computer Teleconferencing

AUDIO TELECONFERENCING

The apparent simplicity of audio conferencing is deceptive. This medium is an extension of the telephone: if two people can talk to each other so easily, why not three, four, or even 12? For many years, the telephone company has provided a "conference call" service that is, in effect, a basic form of audio teleconferencing. However, conference calls are infrequent. The telephone has traditionally been viewed as a two-party communications medium. It's for "calling somebody up," not holding a meeting. People simply do not think about the telephone as a group communication medium. Furthermore, the design of the telephone handset does little to encourage this use for long periods, and speakerphones are usually not of adequate quality to represent a serious alternative. Nevertheless, telephone technology seems to be quite adaptable for group conferencing needs, as demonstrated by those systems developed specifically for this purpose.[5]

Several Systems for Low-Cost Conferencing

Typical of the permanent audio conferencing installations that are now being implemented is the system of the Canadian Department of Communications. In this system, six conference rooms are connected by high-quality voice channels. Each room has four microphones which automatically switch on as a person speaks. The National Aeronautics and Space Administration has a special facility in Huntsville where "audio bridges" are created among the various conference rooms. The Bank of America and the University of Quebec also have operational systems which are in regular use. The Remote Meeting Table in England even has individual speakers for participants, so that each person's voice is heard through only one cabinet labeled with his or her name.

The costs of such systems are low. Audio teleconferencing uses inexpensive telephone lines. For those systems which use the existing telephone

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[5]While most audio teleconferencing systems to date have been specially designed for limited users, there are plans to test market dial-up conferencing for regular telephone subscribers over the next few years.

network, the cost is particularly low, although it will increase as more people join the conference. Permanently installed audio conferencing systems which use dedicated lines are more expensive to use, but they provide greater reliability and a generally higher voice quality. Also, the higher cost can be balanced by higher use. The University of Wisconsin-Extension, largest audio teleconferencing network for education, estimates that its system costs only 25 cents per student contact hour, not including the instructor's time (Parker and Riccomini, 1976). This figure is an operational cost, however, and does not consider initial equipment investments.

A Quality Problem

One problem which has plagued audio teleconferencing is that of acoustical conditions within conference rooms. Hough (1976) describes the Bank of America audio system in San Francisco, which is generally acknowledged as being of the highest quality: "Achieving this system required unusual measures. Most surprising of all are the structural aspects. The room is completely isolated mechanically from the rest of the building, despite its being in the middle of the building, on one of the top floors. Moreover, no wall is parallel to any other wall." Such elaborate designs may be possible for large organizations establishing permanent conference rooms, but they certainly present problems, especially for portable systems.

The problems of acoustics arise primarily in conference room-to-conference room situations in which more than four people share each location. For smaller groups, acoustical arrangements are much easier. Interestingly, some of the simplest systems are also the most effective--in spite of the room acoustics problems. The Bell Telephone 50-A system, for instance, is a simple portable speakerphone, yet it is basic equipment for the very successful University of Quebec audio teleconferencing program. Thus, while acoustical problems are annoying in the design of teleconferencing rooms, they are avoidable if groups are kept small and some care is taken.

Order of Speaking: A Small Group Problem

Perhaps the toughest problem in audio teleconferencing is the issue of *order of speaking*. In face-to-face, visual signals usually aid this process; one can sense from gestures and motions when another is almost finished speaking and even get some sense of others who are waiting to speak next. In audio teleconferencing, however, there are no such visual clues, and the logistics of speaking order--and sometimes even *who* is speaking--are basic problems.

The engineers' response to this problem is voice-switched microphones: a speaker's voice captures the sound channel and forces others to wait until he or she is finished. Small group interaction is more complicated than that, however, and it has been found that a voice-switched system can be very annoying. A cough or a sneeze, for example, grabs the microphone as easily as a spoken word. (The engineers' response here is a "cough button" which a participant presses when he feels nature calling and doesn't want to steal the microphone.) Beyond the cough button problem, voice-switching can also be perceived as a strong limit on group spontaneity. Speakers keep the floor as long as they continue to talk; interruption of the speaker is technically impossible. Then, when the speaker is finished, the other eager participants jump in with vigor--only to find the microphone lured away by another's voice.

The alternative to voice-switched microphones is an "open system" which allows everyone to speak at once. Such a system is more flexible but still leaves unsolved the problem of speaking order. The result is often a staccato of simultaneous speaking patched with periods of awkward silence.

While interpersonal logistics within an audio teleconference remain awkward, emerging systems show definite improvements. Speaker identification is one aid to the social problems of audio. *Telecom Australia* is experimenting with a multilevel, open microphone system. Here, the speaker is given a higher volume level than the other participants, but it is still possible to interrupt. The *Telecom Australia* system is not voice-switched, but is activated by a button on each microphone. The system is also tied to a microcomputer which allows for queueing of speakers waiting their

turn. The queueing order is displayed on a lighted panel with the names of all participants. This system, still in the testing stage, even features lights which pulse to the rhythm of the speaker's voice. These advances illustrate some potential variants of audio teleconferencing, but raise questions about the degree to which such systems can mechanically insure smoothe interpersonal exchanges. Even with the best technologies, some problems seem likely. And *too* many gimmicks could certainly impede group communication.

In 1985 . . .

Extrapolating this technology to the 1985 time frame, we assume casual access to systems in which voice transmission would be of high quality, without the "speaking-in-a-cave" sound of today's speakerphones. Use of handsets would be optional. A lighted panel might indicate who is speaking, and a basic graphics capability would be available to send photocopies over telephone lines. A transmission scrambler would provide a basic level of confidentiality.

Figure 3. The Educational Telephone Network at the University of Wisconsin-Extension

FACE-TO-FACE CONFERENCING: COMPARISONS WITH TELECONFERENCING

When someone "attends" a teleconference for the first time, comparisons with face-to-face meetings are inevitable. Face-to-face communication is the unquestioned standard. And not surprisingly, many of the criteria for evaluation of teleconferencing involve comparisons with face-to-face patterns. Yet, teleconferences are not necessarily surrogates for face-to-face meetings. Furthermore, meeting in person has its own limitations--both obvious and subtle.

The fundamental characteristic of face-to-face conferencing is "presence." The ability to share the same space, to reach out and touch a person often *is* communication. On the other hand, we know that presence is *not* essential and may even be distracting for some kinds of communication. Our approach in this report has been to treat face-to-face as "one more medium" from which to choose. In this report, we have attempted to ask the same questions about this medium as we ask about video, audio, or computer conferencing. In doing so, we have made no attempt to refer directly to the vast literature on small group communication[6]--which typically involves *only* face-to-face communication. Rather, the only face-to-face literature consulted here is that which involves comparisons with teleconferencing media.

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[6]Basic references to the more general small group literature can be found in Joseph E. McGrath and Irwin Altman, *Small Group Research*, New York: Holt, Rinehart, and Winston, 1966; Marvin E. Shaw, *Group Dynamics: The Psychology of Small Group Behavior*, New York: McGraw-Hill, Inc., 1971; Ivan D. Steiner, *Group Process and Productivity*, New York: Academic Press, 1972. For comparisons of small group literature with issues of teleconferencing evaluation, see Starr Roxanne Hiltz, *Communication and Group Decision-Making: Experimental Evidence on the Potential Impact of Computer Conferencing*, New Jersey Institute of Technology, 1975; Robert Johansen and Jacques Vallee, *Impact of a Computer-Based Communications Network on the Working Patterns of Researchers*, American Sociological Association Annual Meetings, New York, 1976.

II. TELECONFERENCING IN 1985: SOME SCENARIOS

The existing teleconferencing systems are only early prototypes of the kind of beast that will be unleashed on the world of communication. Similarly, the current evaluations of the media are probably only hints of the ways in which teleconferencing may change small group communication. To dramatize the long-term implications of these early findings, we have taken an imaginary leap to 1985, where we explore, in scenario form, the potential of four media for an international meeting. The meeting has been arranged by a foundation official in response to an impending crisis--a drought in the fictitious African country of Camelia. It is a bilingual communication situation (French and English), involving a blend of data interpretation, information exchange, negotiation, and decision-making.[7] Eleven people, representing local, regional, and international points of view, participate in the meetings. Although there is no immediate crisis, the threatening drought is serious enough and the time frame short enough to provoke a definite need to communicate and a recognizable outcome from the proceedings.

The purpose of the scenarios is to illustrate both *effective* and *ineffective* uses of audio, video, and computer teleconferencing as well as face-to-face communication in this situation. Accordingly, there are two scenarios for each of the media. These scenarios were developed from the "strengths" and "weaknesses" of each medium, included in the Summary of Social Evaluations of Teleconferencing at the end of this report. The focus is on small group communication--the issues of choice among media, of leadership, and of self-presentation. The reader should keep in mind

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[7] This situation was inspired in part by the novel *L'Imprécateur* by R. V. Pilkes (Paris: Le Seuil, 1976). This book was awarded the Femina Prize in 1976; it describes the collapse (both physical and cultural) of a large business organization in which multilevel communication problems become overwhelming.

that we are *not* attempting to forecast political or social realities of the 1980s. We have purposely refrained from any major variance from the current world situation. Certainly, the sociopolitical variables we have ignored will have profound effects on the ways in which teleconferencing media are used in the future. Such effects, however, could only have been considered here at the expense of our concentration on communication styles.

While the scenarios are dramatizations of the strengths and weaknesses of the four media as revealed by evaluations to date, they are necessarily more. The current evaluations do not tell us how an African economic minister will get to know an American diplomat in a computer conference. Or how a voice-only medium will convey three distinctly different cultural perceptions of a problem like a drought. To answer questions like these, we have had to *interpret* the research findings, to relate them to such basics of communication as trust and the need to communicate or the availability of feedback channels. And occasionally, we have had to guess.

This section, then, begins with two memos from Bill Owens, our imaginary foundation official,[8] who describes the situation in Camelia and proposes a conference. The memos are followed by two scenarios for each medium; in these scenarios, the same general variables combine, as a result of different media, to produce success or failure in the meetings. After each pair of scenarios, an analysis traces the links between events in the scenarios and the medium "strengths" and "weaknesses" which inspired them. These analyses identify some of the contradictions in the findings to date and explain the position that we took in these cases. It notes the points at which we feel we are on the terra firma of the research data and those points at which we are speculating. In so doing, they also identify some of the major leadership issues embodied in the scenarios.

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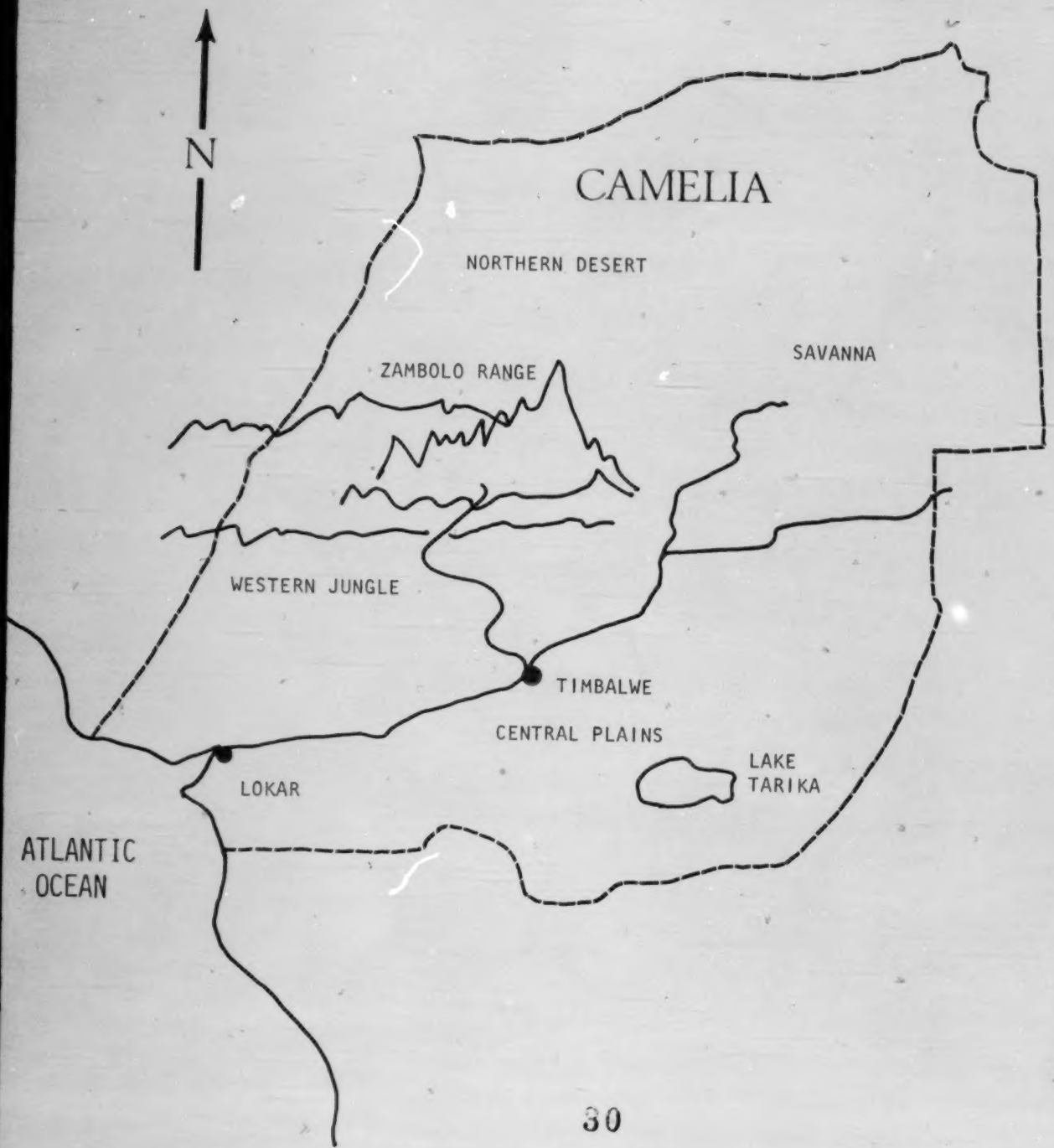
[8]While we use the Kettering Foundation name in these scenarios, we do not mean to depict any current or planned activity of that Foundation. The people and organizations, as described here, are purely fictitious.


N
CAMELIA
NORTHERN DESERT
SAVANNA
ZAMBOLO RANGE
WESTERN JUNGLE
TIMBALWE
CENTRAL PLAINS
LAKE
TARIKA
LOKAR
ATLANTIC
OCEAN

MEMO TO: Planning Committee, Kettering Foundation
FROM: Bill Owens, Program Director, Task Force on Food Supply
DATE: 3 January 1985

SUBJECT: CAMELIA DROUGHT PROJECT

I have returned from Camelia and Paris with a feeling of urgency regarding the threat of drought in Camelia. The country may be entering a period of extended drought. It had an extremely dry and poor growing season last year, and a seriously underaverage rainfall over the past three months. As you are aware, such a drought would compound the already severe problems of malnutrition in that area. My meetings on this trip confirmed our earlier belief that there is no comprehensive international activity under way to assess the extent, seriousness, impacts, and likely duration of the possible drought; nor is there any concerted effort to mobilize those organizations essential to short- or long-term remedial action.

I see several possible goals for the Foundation, should we decide to become involved in this situation. The most important from our standpoint is to establish communication among the major actors. Possible tasks would be to:

- evaluate the validity of the existing data;
- place the current weather conditions in the context of regional climate trends;
- assess the possible impact of a continuing drought; and
- develop alternative responses for an effective relief program.

During my trip, I identified several likely participants for such a study. In Lagos, I met with officials of the African Agricultural Board, notably Eduardo Ribera who was extremely concerned by the discrepancies in the data and who is anxious to hear the American experts on this question. In Timbalwe, Camelia, I had little opportunity to verify the reports about the impending drought. Certainly, everyone I met there was concerned, and some emergency measures were already in evidence in the city. I did meet

with economic minister Abu Arume and his staff, who stated they would be willing to discuss the problem in meetings, provided the discussions weren't held in the United States. They would probably send three representatives. In Paris, I met with Helene Dubarieux of the Lutte Contre la Famine (LCF). She is an attractive, talented French woman who has an attitude of suspicion toward technology and appears to harbor an emotional skepticism--sometimes hostility--toward the involvement of the advanced nations in the Camelian situation. The LCF itself is a well-respected activist group with a strong involvement in countries such as Camelia.

I wasn't able to get an appointment with Jack Morris, who is the Euro-African representative of the Consolidated Produce Organization, but I spoke to him on the phone, and he advised me to extend an invitation to George Clemmons, Jr., the chairman of Consolidated Produce, based in Nebraska. I think he reflected their general attitude of doubt regarding the drought in Camelia, which he said may be grossly exaggerated. I could feel a good deal of potential antagonism toward Consolidated Produce during my trip abroad, and I think it would be politically advisable for a member of our board to contact Mr. Clemmons directly and find out how he would feel about being involved in the meetings.

In addition to the Camelians, the LCF, and Consolidated Produce, I think we should identify one or two American climatologists, a representative of the Council of African Missions, and someone from Project Progress. That makes about a dozen people who probably have never met as a group, though some of them have certainly known each other individually.

In organizing this conference, we should think carefully about the various modes of conferencing open to us. We could, of course, hold the meetings face to face. I would prefer to have them in Camelia, but Clemmons may not agree to this. Paris also might be a logical place. Facilities would be placed at our disposal by the French government, which would also provide translations. (The Camelians speak French, but I don't believe Clemmons does. My French is pretty bad, and I don't think Morris fares much better. Ribera and Dubarieux strongly recommended conducting the meetings in two languages.)

If we decide not to rely solely on face-to-face meetings, then we have three other options, which can be used alone or in combination: video, audio, and computer-based teleconferencing. Computer conferencing would not be a problem in terms of equipment. Even Timbalwe has a World Net connection, and I have seen their terminals. They have the high-speed type with a graphic display capability, so we could discuss models and trends. I can arrange to have a couple of interpreters standing by on the network. Similarly, audio conferencing would be no problem: there are facilities at all sites through the local phone companies or government agencies. In Camelia, they would even make the emergency lines available to us if we ran into noise problems with the normal circuits.

If we decide to go the video route, I think we should use one of the commercial video conferencing services which are worldwide and can supply interpreters and camera technicians at all sites with very little advance notice. Their equipment will send a color image through a satellite to as many as 10 sites simultaneously. We need to think about the number of sites necessary for such a conference.

A word about costs: all of the electronic media are potentially less expensive than face-to-face meetings. Video is at the high end of the cost scale while audio and computer conferencing are comparable. However, it is important to note that the type of communication developed will vary considerably from medium to medium, making real cost comparisons difficult. Thus, our choice should not be determined as much by cost considerations (since all of the media are within our grasp) as by our communication needs.

This situation presents us with a fine opportunity to facilitate a collaborative network; but at the same time, if such an attempt backfires, the consequences in terms of economic and social conditions in Camelia, to say nothing of our reputation, could be severe.

CONFIDENTIAL

MEMO TO: Planning Committee, Kettering Foundation

FROM: Bill Owens, Program Director, Task Force on Food Supply

DATE: 5 January 1985

SUBJECT: PARTICIPANTS IN THE CAMELIAN DROUGHT MEETINGS (Please keep confidential)

Since several of you have asked about suggested participants in the proposed Camelian Drought Conference, I decided to circulate this memo with my own (candid) perceptions of them. I have selected the participants carefully in order to represent all of the important points of view on the Camelian drought. However, I want to limit the core group to 10 in order to enable full interchange of viewpoints. Naturally, these descriptions should be kept confidential, since they are only my own views.

Let me begin at the center of the potential crisis, which is Camelia. This large country in what used to be French Africa is a quasi-democracy with a history not unlike the rocky road faced by most developing countries. Abu Arume, the economic minister, is a key to power in the country's agricultural and rural development policies. He is a political animal, with an innate instinct for the political arena. To Americans, he has often appeared domineering and may even be perceived as bizarre. He appears to have great leverage within Camelia, however, and his role is vital to the success of the conference. To give you a sense of his style, Arume is said to have changed the course of a national council meeting through a single 15-minute speech. During the speech, he flung his coat on the parliamentary floor and tore open his shirt. When he finished, some council members were actually in tears. Obviously flabbergasted, they left in awe--and probably in some fear--of Arume. I share this anecdote with you even though it may have become something of a legend by now. Arume is explosive, but he is crucial to the success of the conference.

Camelia will also be represented by two other government officials, Francoise Mwanga and Cyprian N'dolo. Ms. Mwanga has a Ph.D. from the School of Public Policy at Berkeley and is the first female head of the Camelian

Office of Planning. (Actually, the office was only established 10 years ago.) I don't know a lot about her, except that her training is good and she may be able to serve in a supporting role. I don't expect her to be dominant, though. Similarly, I don't expect too much initiative from Cyprian N'dolo, but as a top Camelian Weather Bureau official, he has access to important information about current conditions there and is well respected by the local farmers.

Bishop Ampleby, a 40-year-old veteran of such meetings, works with the Council of African Missions. He has the air of a rugged explorer even on those rare occasions when he wears his holy collar. He is easy to talk with and relaxing to be around; he is also knowledgeable and tough. He currently manages agricultural development programs in five rural African countries including Camelia. He's had this job for only three years now, but has over 15 years' experience with African food problems. He should be a mediating force in the conference, but only if Camelia gets a fair shake. He'll drive a hard bargain if they don't.

The U.S. State Department and the Department of Agriculture decided five years ago to join forces in coordinating policies about providing foreign agricultural assistance. This coordination is administered by Project Progress. The program hasn't won the hearts of Congress as yet, so funding for the organization hasn't been generous. It is thus a rather skimpy attempt by the State Department to respond to emergency situations such as that which may be arising in Camelia. But it could act as a catalyst in marshalling U.S. technical assistance and in providing seed funds for international relief measures. It is headed by Allan Draper, an American who has been in Paris for several years. Draper is a diplomat with a background in economic planning. Although we met several years ago, I don't really know a lot about him. Project Progress could be of some assistance for drought relief, but they're really not big enough to do much.

I plan to include two representatives from Consolidated Produce Organization. As most of you know, Consolidated Produce is a multinational agribusiness corporation, which functions as a public consortium. It plays an important role in Camelia's economy (and other aspects of its culture as well) because it purchases and processes a significant portion of Camelia's

crops for eventual resale in foreign markets. It also sells some agricultural products, such as seed and fertilizer, to the country. Given its importance and leverage in the Camelian economy, Consolidated Produce is always under close scrutiny by some quarter in Camelia and by those groups whose cause is the equitable development of the poorer countries. Relationships between the conglomerate and the Camelian government over the past five years, however, have been workable, although occasionally tense.

Consolidated Produce is represented in Paris by Jack Morris; I have invited him to participate in the meetings. Morris reports directly to George Clemmons, Jr., in Lincoln, Nebraska--the organization's international headquarters. Clemmons is a classic example of a successful international businessman. He is a sophisticated corporate leader and his Nebraska drawl is a powerful force around any conference table. (Incidentally, he is also a prominent member of the First Methodist Church of Lincoln--the same denomination as Bishop Ampleby.)

Two regional groups will be represented, the most cautious of which is the African Agricultural Board. Eduardo Ribera will be their representative and could assist in interpreting the discrepancies in the various data on the agricultural impacts of the drought. He is an outstanding economist, though he doesn't have a lot of international conferencing experience. As I indicated previously, the African Agricultural Board has demonstrated a willingness to give technical assistance, as well as favorable loans, to third world nations hit by adverse climate conditions--perhaps more a show of long-range self-interest than altruism, but important in our situation, nevertheless.

Helene Dubarieux of the Lutte Contre la Famine (LCF), will definitely be an important force in the conference. The LCF is an activist group with considerable legal sophistication; it has been a strong force for the rights of developing countries and has access to powerful press channels. They distrust Consolidated Produce, and they have argued against it as another "big business" conglomerate. Helene is one of the LCF's most articulate spokespersons; her conscientious and aggressive style as well as her unique viewpoint suggest that she will be a strong participant.

There is some question about how serious and extended the dry conditions in Camelia are likely to be. One group that has geared itself up over the past decade to help assess situations such as this is the International Association of Meteorologists and Climatologists, of which Professor Glenn Pierson is an officer. He is Professor of Climate Studies at the University of Colorado, and has written extensively on food and climate problems. His background includes work with OXFAM in England, and he is an expert on crop-growing in arid lands. We have worked with him frequently before; while he is sometimes a bit shy in such gatherings, he should be an excellent resource person.

As you can see, this array of participants does not promise instant communication. On the other hand, I think all of them have some stake in a positive outcome--even though there are certainly diverse points of view represented. Clemmons, Dubarieux, and Arume are perhaps the strongest personalities, but some of the others may surprise us.

PARTICIPANTS IN THE CAMELIAN CONFERENCES

Abu Arume
Economic Minister, Camelia

Francoise Mwanga
Camelian Office of Planning

Cyprian N'dolo
Camelian Weather Bureau

Bishop Ampleby
Council of African Missions

George Clemmons, Jr.
Chairman, Consolidated
Produce Organization

Jack Morris
Euro-African
Representative
Consolidated Produce
Organization

Bill Owens
Charles F. Kettering
Foundation

Helene Dubarieux
Lutte Contre la Famine

Eduardo Ribera
African Agricultural Board

Glenn Pierson
Professor of Climate Studies
University of Colorado

Allan Draper
Director, Project Progress

VIDEO TELECONFERENCING
EFFECTIVE USE

Allan Draper

Project Progress

April 13, 1985

Ms. A. Henley
Conferencing Unlimited, Inc.
2740 Kissinger Plaza
Washington, DC

Dear Ann:

As you requested, I'm writing this letter to record my reactions to the video teleconference on the Camelian situation. Since you and your colleagues at Conferencing Unlimited were so helpful in the preparation stages, the least I can do is take a few moments to tell you how it worked out. We have made good progress, with the Camelia problem just about solved now, and the draft of a relief plan is in its final stages. I think all of us in this conference were pleased with the interaction within the meetings, which was disciplined, but friendly. Your colleagues in the visual communications trade are to be commended for the fine job they've done in training people for the subtleties of video communication. I was really struck by the general improvement in conferencing skills in just the last five years since training programs have been in full swing. (When were the first training programs begun? 1978?)

Before the meetings began, Bill Owens talked to each of us individually over the VideoCom system. These introductory sessions were very useful. We were able to check out the VideoCom rental equipment (no shorts in my system this time!) and to make sure our office arrangements were comfortable. During these sessions, Bill also went over the background of each of the other participants. We had received biographical information by electronic mail, but I'm sure Bill wanted to reinforce our similarities and downplay our differences so we could get off on the right foot.

After our individual meetings with Bill, we all traveled to Crete for a two-day weekend meeting. It was a fairly informal occasion, and Kettering had arranged for a private villa which could accommodate everyone. We set some preliminary goals and scheduled the video meetings. We also got to know each other personally in the course of these preliminary sessions. I think if we hadn't met face to face, I might have had a very different impression of some of the participants. Like Jack Morris--in person, he was easy going and friendly. But over the system, he came across like Mr. Cool Efficiency. On the other hand, Helene Dubarieux's personality seemed unchanged by the video medium; she was as warm--and as volatile--in the conference sessions as in face-to-face.

Once the video meetings began, it was apparent that Bill had really done his homework on the use of video conferencing. The weekly VideoCom sessions of the group were strictly limited to one hour in length. Agendas were sent the day before, and the meetings always began and ended on time. This schedule was great for me; the formality and the lights and the general tension can really be tiring if meetings go much beyond an hour. But I also know that the short meetings were a mixed blessing to Arume. He explained to me in a phone call one day that, while the time restrictions allowed him to keep on top of all of the immediate pressures in his office, they also made him uncomfortable because he felt some of the issues couldn't be discussed in such a short time and he hated to break off the discussion in the middle of a disagreement.

Actually, his comments helped me overcome some of my anger at him on a couple of occasions. It often seemed that he was trying to stall a discussion right when we were getting to a workable solution. Clemmons

actually accused him of this once. Gradually, though, I realized that Arume wasn't stalling at all; he simply had a different perception of the problem than some of us did. He really had no doubt that we could feed several thousand starving Camelians, but he wanted to know what would happen to them after they were fed. Bill was quick to recognize this difference and occasionally arranged additional sessions so that we could pursue the special concerns which were not always on our agenda. I certainly never objected to an additional session with Arume. He's such an animated speaker. You can be sure no one ever falls asleep watching him on a screen!

In general, Bill encouraged a highly interactive conferencing style. At the very first video meeting, for example, he invited N'dolo to begin the discussion. Well, N'dolo was obviously uncomfortable and resorted to reading a prepared "speech." But Bill interrupted him right away with a question, asking Glenn Pierson to comment, too. His question broke the ice, and N'dolo, obviously relieved, responded casually to our questions. It really has been my experience that, once you break through that initial awkwardness of talking "for the camera," video conferencing seems to encourage everyone to participate.

As the meetings progressed, we tried to focus on the information exchange, discussion of ideas, and problem-solving aspects of our tasks, occasionally calling in outside resource people from various locations to help out. We definitely avoided video negotiations. For instance, George Clemmons suggested a change in the Camelia export tariff structure at one point. As you might guess, this was a highly controversial proposal, so Bill tabled it until a face-to-face meeting with Mwanga, Arume, Clemmons, Ribera, and Dubarieux could be arranged. The proposal was complex; the arguments were subtle; and the members wanted direct face-to-face discussions to deal with such concerns, though some background discussion of the proposal was carried out by teleconference and written papers. (Bill also used personal telephone calls to follow up meetings in which the tensions ran high.)

At one point in the meeting, just as it seemed that we were getting wrapped up in the immediate problems of communicating with each other, Bishop Ampleby requested that we take 10 minutes of group time to see a

videotape he had on the current situation in Camelia. The tape was made by one of his colleagues, and it was not much of a film by Hollywood standards. But it did provide a good current image of the country. Also, since Clemmons hadn't been in Camelia for several years, the film was really useful. Later in the meetings, when particular areas of Camelia were being discussed, Ampleby would dispatch his colleague to get some more pictures, and we saw them as quickly as the next day through another videotape. These tapes--there were five in all--helped us to visualize the situation and gave us a sense of perspective which injected life into even the dullest of data-base debates. Incidentally, each session was also videotaped and became an important record to which we sometimes referred later, even though it is difficult to access information stored on videotape.

Of course, Bill was also sensitive to the dangers of the "visual channel." I recalled your little lectures on how important nonverbal communication really is--that hand movements, for instance, can come across so differently over TV compared to face-to-face situations. When problems in nonverbal expression occurred, either Bill or the translators would step in. The translators both watched and listened and occasionally interpreted the gestures as well as the words of a speaker. Each participant, however, pledged at the start of the meetings that no other observers would be present off camera at their location.

There was one really fascinating exchange last week between Eduardo Ribera and Francoise Mwanga about the actual meaning of some crop production data. I don't think the problem could have been resolved if Mwanga hadn't been able to draw from the resources of her department and some contacts at the University of Camelia. In a face-to-face situation, she would have lost the argument. Here, she just asked to reschedule the afternoon session for the next day, and she spent the evening with her colleagues, checking all the calculations. The next day, they made a television presentation based on map overlays and graphs which was the turning point of the whole thing: they found that both sides had been right all along, in a way. There had been a decline in Camelian production before the drought (so Mwanga was wrong), but it wasn't due to poor management of the agriculture as Ribera had claimed. Instead,

some correlation analyses with other social indicators suggested that rapid urbanization and industrialization in Northern Camelia as well as its neighbors were to blame. This means that no ad hoc program is going to provide a permanent solution. There is an interesting diplomatic situation here because a large part of Africa will have to face the problem in a concerted fashion.

Anyway, our job is almost done, and we have drafted a plan that should be signed by the middle of next week. If all teleconferences went this well, I just might convince the State Department that I could run the Embassy from Washington! Oh yes, I know my job involves a range of communication activities and VideoCom won't substitute for all of them. I guess I'm still doomed to occasional jet lag and high Paris prices.

Thanks again for your help.

Best regards,
Allan

VIDEO TELECONFERENCING

INEFFECTIVE USE

MEMO TO: Headquarters, Council of African Missions, Nairobi (Kenya)

FROM: Bishop Ampleby, Timbalwe

DATE: 17 March 1985

SUBJECT: CONTINUING DROUGHT IN CAMELIA

It is with sadness and some bitterness that I must report another failure of the "advanced countries" in applying their resources to a real need in this continent. This time, the Kettering Foundation raised high hopes of coming to grips with the threat of drought in Camelia. But instead of a working conference, all they have obtained for their money is another example of "show business." Their decision to hold the meetings by television contributed greatly to their ultimate failure.

The Video Travel System was adopted as the official communications medium by Kettering--they told us--as a response to several strong concerns:

1. The economic burden of continuous travel is becoming oppressive.

2. Fear of crime and terrorism has mounted to the point where people of the calibre of Consolidated president George Clemmons travel only at high risk outside the United States; video conferencing allows everyone to stay home in guarded rooms.

3. Video Travel allows more control of the group since all the interactions are via the medium (usually taped), not in backroom meetings.

4. Much higher consistency in multilanguage communication is possible due to the translation of several languages simultaneously via a central switchboard in the Video Travel system.

The Video Travel brochures promise a "communications intimacy found previously only in face-to-face contact." Video Travel, they say, offers the warm familiarity of face-to-face communication without many of its

interpersonal burdens--obligations to dine with conference participants, for example. It means precision of communication without a loss of emotional flavor, or so we thought.

The problems began with the conferencing equipment itself. Video Travel normally provides all its participants with the same equipment. But since Consolidated had a fully equipped video conference room at all its major sites, it was possible to simply plug them into the Video Travel system. As it turned out, it was a mistake to let Clemmons use his own conference room; it created an immediate gap in communications. Clemmons sat magnificently behind a massive oak desk with a bronze bust of Abraham Lincoln visible just behind him. He apparently had assistants all around him, feeding him information as he needed it. (The rest of us wondered who he had sitting next to him; I almost always felt like someone was watching us.) The sound and picture quality from his room was impeccable--far superior to that of the rented units from Video Travel. Thus, when Clemmons spoke, he sounded like a stern parent allowing his squeally-voiced children but a few minutes of his valuable time. His voice boomed through the system, seemingly sucking the decibels from the other timid microphones.

In contrast to Clemmons, the Camelians met together in a governmental conference room equipped (temporarily) with Video Travel hardware. The three of them invited me to join them in the room as well, since I was in Timbalwe. I'm afraid the conference room was chosen somewhat carelessly. We were constantly distracted by various technical irritations, such as lighting problems requiring banks of video lights rather than partial reliance on natural daylight. Also, the soundproofing was inadequate, so we had quite a bit of noise from the street below.

In Paris, Jack Morris had his own equipment at the Consolidated regional headquarters; while not as imposing as Clemmons' office, it did provide a higher quality image than did the rental equipment. Helene Dubarieux of the LCF and Allan Draper of the U.S. State Department were also in Paris but shared a single site at the U.S. Embassy. Eduardo Ribera of the African Agricultural Board had Video Travel equipment in Lagos; Owens, the Kettering staffer who called the meetings, was alone in Dayton;

and Professor Glenn Pierson was in Denver. Thus, six of us were in two conference rooms, while the other five were each by themselves. Such an uneven distribution of participants proved particularly troubling. Abu Arume easily dominated our conference room in Timbalwe; even I had trouble getting much in. Arume's sense of presence in person is really awesome, and it meant that the rest of us were subjugated to supporting roles. Arume's presence seemed to come through the video medium all right, but he probably looked somewhat comical in contrast to the stern elegance of Clemmons. Also, it was easy to feel off by ourselves, the only ones with real information, trying like hell to stuff our experience of the impending drought into that silly camera! Clemmons' media superiority made that feeling even worse, and nobody was able to overcome it.

Bill Owens, though certainly well-meaning and likable, proved to be a weak leader because of his isolation from the others. It was as though he thought he could just hook us up through this video beast, add some film resources, and stand back while we automatically solved all the problems. Perhaps he was aiming for flexibility. He encouraged us to be spontaneous, so there was no regular schedule for the meetings; instead, they went on almost daily for three weeks.

One big problem was that none of us had ever met together as a group, and only a few had ever met individually. Obviously, there are ways for group members to get to know each other, but the stress here was more on presentation than interaction. A face-to-face preface to the video meetings might have been a big help. As it was, we didn't even get biographies of the participants in advance of the meetings. When the first video meeting started, we had only hints about the status and personalities of each other. (Incidentally, George Clemmons led the way in hints about *his* status, hardly revealing the best in Nebraskan Methodism.) In the full three weeks, we never really developed efficient communication procedures; we were just a collection of interested parties.

The meetings began on February 23. Owens began with a film about Camelia--a slick, 10-minute state-of-the-country report. These films became regular features, sort of like the opening prayer of the meetings. Kettering had commissioned a commercial news team to put the films together

each day, so we could have a constant update on the Camelian situation. I guess Owens thought that the "crisis mentality" of these films--with their reports on soil and weather conditions, the fears of the Camelian farmers, and the nutritional implications of the drought--would encourage an atmosphere of sober cooperation. In fact, I think they subtly undermined the entire conference. On one hand, they gave us a false sense of confidence that we had the proper knowledge to make decisions. I remember challenging the American Pierson about one of his statements on climate shifts in the Eastern Plateau before I realized that my "knowledge" was really based on one 90-second summary from one of the "Camelian Updates" a few days earlier. Those films were just so polished and neatly packaged, while Pierson's hand-scribbled charts and diagrams were complex and hard to read. I'm afraid it was easier for all of us to rely on the visual impact of films as our common reality than to really explore the data before us.

At first, everyone played the "purity" of video communication to the hilt. The tapes of the first meetings showed polite, respectful exchanges among all the representatives. But it didn't take long for antagonisms to arise. Owens got us started on a monstrous first task: negotiating the administrative structure for a food distribution plan in Camelia. Lots of bargaining was involved, and it was really hard to get down to the real issues. Looking back, it is clear that we all had agendas and that they didn't all fit together neatly. Some sorting process was necessary, and it simply didn't occur. Each of us *presented* our own ideas, but the structure did not encourage enough interaction among us to sort through the differences in our perspectives. When Owens saw us floundering, he shifted to what he thought was a safer topic: the agricultural technologies for responding to the drought conditions. As it turned out, this subject was more complicated than he realized. Pierson began with a professorial lecture and gradually covered his display board with his hand-drawn figures full of numbers which we could barely read on the screen. When Cyprian N'dolo displayed the Camelian statistics, the numbers didn't agree! Each tried to persuade the other that his figures were correct. Jack Morris of Consolidated seemed to have yet another point of view. We struggled on; I *almost* prayed for a commercial to break the tension!

Eduardo Ribera was a sad disappointment. He is a leading world economist and was considered by Kettering to be one of the conference's biggest assets. But he repeatedly failed to share his carefully prepared presentations of charts and tables; he was, after all, very near-sighted and his eyes are sensitive--it would have been difficult, perhaps even embarrassing, to try to read before the camera. At the same time, Pierson, Mwanga, and N'dolo, who could have presented important technical information, hesitated to speak in front of Ribera. The result was an ever-declining amount of technical input to the discussions--and few challenges to what was presented.

As the communication deteriorated, tensions rose. At one point in the discussion, Arume moved his arms dramatically, as he often does when he talks. Clemmons must have been startled by this because he shouted, "Don't shake your fist at me!" I was in the same room as Arume, and he was clearly *not* shaking his fist at Clemmons or anybody else. But it apparently looked like he was over the TV screen! Clemmons ended up breaking the connection abruptly, leaving all of us staring at a blank screen.

So we stumbled from one issue to another, with group leadership juggled in the growing verbosity contest. Some people were definitely more skilled in this contest than others. Previous experience with this technology was uneven. Within Consolidated, video travel is often used as an official communications medium; most administrative tasks--important negotiation sessions--are conducted by video travel. The representatives of the other organizations generally had some degree of previous experience with it, too. Unfortunately, many "training sessions" for video teleconferencing are more like lessons in theatrics than lessons in communication. The result is the manipulation of meetings by the most skilled "actors." In our case, I expected Arume to be a natural, but I was struck by how Jack Morris consistently came out on top in any discussion. Thanks to some investigative work by Helene Dubarieux and the LCF, we discovered before too long that he was actually an accomplished actor substituted for the real Jack Morris for the later sessions. Many of his "spontaneous" speeches were in fact prepared and skillfully read from hidden cue cards. They even had a make-up kit for him! Of course, Consolidated claimed they only attempted this tactic *after* it appeared that the conference was hopelessly bogged down.

I'm afraid that the promise of Video Travel and its apparent ability to provide continuous "communication" led Kettering to rely too fully on this technology. Once fallouts in trust levels among participants began to occur, video travel offered no channels for restoring communication.

For me now, it is back to the bush with the prospect of another long struggle to help the villagers survive. Once again, I will rely on Headquarters' support of our efforts in Camelia. I am afraid we will be very much on our own from now on.

VIDEO TELECONFERENCING ANALYSIS

If it is really true that "a picture is worth a thousand words," video teleconferencing has some obvious advantages. Visual information--a smile, a photograph, a map--can be exchanged easily over video. Also, gestures are easily communicated, serving to lubricate group interaction. Yet, video conferences are not carbon copies of face-to-face meetings; they have their own set of rules and their own traps for the unsuspecting conference organizer.

THE HOLLYWOOD SYNDROME

New users of video teleconferencing often unconsciously associate video teleconferencing with Hollywood-style movies and television. Broadcasting words from the world of television often litter the operation of a new teleconference: participants talk about the "program," the "studio," the "director" (V57[9]). Such an association tends to make the group--especially new users--very self-conscious and can encourage a presentation style of communication. This style dominated the Ineffective Scenario, as Bishop Ampleby noted:

> Each of us *presented* our own ideas, but the structure did not encourage enough interaction among us to sort through the differences in perspective. . . . Instead of a working conference, all they have obtained for their money is another example of "show business."

The association with television was subtly encouraged in this scenario by the Camelian Updates--"slick, 10-minute state-of-the-country reports." With weak empirical support (V53 is only indirectly related), we nevertheless speculate that video teleconferencing can potentially create a false

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[9]The codes in this analysis refer to the numbers of the "strengths" and "weaknesses" listed for each of the media in the Summary of Social Evaluations of Teleconferencing in the Reference Materials. Thus: V for video, C for computer conferencing, etc.

sense of confidence in one's information. Just as television news broadcasts provide the illusion of total news coverage in a very short time (Consider Walter Cronkite's closing message: "That's the way it is . . . ."), packaged programs such as the Camelian Updates might provide a false sense of being in control of the necessary information. In our opinion, such a mood becomes particularly volatile when complex topics arise, as was the case in the Camelian conference. Of course, the use of visual information does not have to be misleading. In the Ineffective Scenario, Bishop Ampleby made use of the visual capacity in a similar--but much less polished--fashion. He supplied amateur videotapes which were taken in Camelia and sent immediately to the teleconference. Without the ritual and the polish of the Camelian Updates, these films assumed a more humble, but probably more appropriate role in the conference.

In the extreme, the "Hollywood" qualities of video could encourage deliberate deception. Users of video will require some initial training in effective self-presentation via the medium, but the line between effective presentation and deception may be as difficult to draw as the line between effective and deceptive use of television by political candidates. The make-up kit and the hired actor in the Ineffective Scenario, though probably extreme, illustrate the dark side of the same skills which are necessary to effectively communicate via the medium. Of course, comparable problems can arise with any communications medium, including face-to-face. However, with teleconferencing, we suspect that, because of the lack of social presence (V49, V50, V52), it will be particularly difficult to restore a sense of group trust once trust levels have deteriorated.

VIDEO PERSONALITIES

Even with training, individual skills in using the video medium are likely to vary. Video teleconferencing has basic characteristics which lend themselves better to some interpersonal communication styles than to others (V55). The most obvious of these is the ability to communicate visually as well as orally. For someone who relies on expressive gestures to communicate, the visual channel promises to be an important plus. In

the Ineffective Scenario, however, it didn't work out that way for Abu Arume:

> At one point in the discussion, Arume moved his arms dramatically, as he often does when he talks. Clemmons must have been startled because he shouted, "Don't shake your fist at me!" I was in the same room as Arume, and he was clearly *not* shaking his fist at Clemmons or anybody else. But it apparently looked like he was over the TV screen!

With no direct empirical support, we speculate that gestures which are acceptable by one medium may be perceived as hostile through another. This possibility is increased in a cross-cultural situation, where gestures may be misunderstood at the outset! In the case of video teleconferencing, we are guessing that gestures like Arume's arm movements might appear amplified and even violent when projected on a television screen. The example may be overstated, but we feel that situations similar to this are likely to arise.

The visual channel also proved to be more burdensome than helpful to the near-sighted Ribera. He struggled with charts and figures, and it was difficult for him to read before the camera. The result was an embarrassing situation for everyone. Since Ribera's inability to develop a strategy for effective self-presentation is linked so closely to his near-sightedness, the problem is most likely Owen's fault for not predicting such an occurrence. Group leaders making choices among media will have to consider participant/medium matches as part of their planning.

Group leaders may have to invest extra care in participant/participant matchmaking, too. Video teleconferencing has not yet been demonstrated as an effective medium for getting to know someone or for meetings among strangers (V41, V43, V44, V49-V51). While there is some debate on this point (e.g., V10), we think Bill Owens took a big chance by not scheduling a face-to-face meeting *before* the group began to use the video medium. If he were forced into this position, he should at least have provided biographical information in advance and focused on social issues as much as possible during the first meeting (by pointing out common areas of interest for example). As it was, the group had "only hints about the status and personalities of each other." And evaluations of video suggest that confusion about status and roles can only create problems in video conferencing (V7, V41, V42).

In the Effective Scenario, Owens gets a better score. Here, he held preliminary sessions with each participant over the VideoCom system: "During these sessions, Bill also went over the background of each of the other participants. We had received biographical information by electronic mail, but I'm sure Bill wanted to reinforce our similarities and downplay our differences so we could get off on the right foot." Notice that Owens also raised the issue of off-camera observers immediately, since video has been criticized for lacking a feeling of privacy (V53).

THE VIDEO CONFERENCE ROOM

Basic to the success of a video teleconference is the physical arrangement--the way in which the electronic conference room is created. Ill-conceived arrangements can have strong negative effects on the conduct of teleconferences. The most extreme example of this problem in the Ineffective Scenario is the imbalance between the conference arrangements for George Clemmons and those for the Camelians. Clemmons used his specially equipped room, which emphasized his strength in the proceedings: "Thus, when Clemmons spoke, he sounded like a stern parent allowing his squeally-voiced children but a few minutes of his valuable time. His voice boomed through the system, seemingly sucking the decibels from the other timid microphones." Meanwhile, the Camelians spoke from carelessly arranged temporary facilities and were immediately at a disadvantage.

This technical inequality was amplified by the unequal distribution of the participants among the sites. Multilocation video teleconferencing is technically difficult anyway, due to problems of showing all the participants on screen simultaneously. But particularly when there are unequal numbers of people at each location, there is a high probability of "insider-outsider" feelings (V57)--sometimes leading to overt hostility. The people in one conference room are likely to feel "closer" to those in the same room and more "distant" from those in the remote location. Ampleby expressed the sentiments of the Camelians:

> . . . it was easy to feel off by ourselves, the only ones with real information, trying like hell to stuff our experience of the impending drought into that silly camera!

Providing the electronic links is only the first step in creating a communication "space." In the Ineffective Scenario, Owens did little more: "It was as though he thought he could just hook us up through this video beast, add some film resources, and stand back while we automatically solved all the problems." In the Effective Scenario, however, he paid close attention to details of scheduling, for example. Current results suggest at least tentatively that some sort of regular schedule is necessary for the use of video teleconferencing, particularly with a new group (V4). Having done his homework, Owens scheduled weekly sessions, strictly limited to one hour in length. He made sure that agendas were always available in advance, too.

The role of the leader *during* a video teleconference is open to some debate. A study on the use of the Bell Laboratories video system concludes that a regular committee-like structure is required (V4, V8). However, there is also evidence to suggest that formal organization of the meeting is not very important via video. One field experiment indicates that the time spent maintaining group organization is lower by video than by audio, though higher than face-to-face (V28). Another study, based on a series of laboratory experiments, suggests that an "unorganized formality" develops in a video teleconference, eliminating the need for strong, overt leadership (V32). In the scenarios, we have adopted a moderate position: Owens was a strong (but not rigid) leader in the Effective Scenario, while he asserted no leadership in the Ineffective Scenario. We *do* feel that strong leadership will be necessary in this communication situation, no matter which medium is used.

VIDEO FOR WHAT? NO SIMPLE ANSWERS YET . . .

By task analysis alone--which tasks are affected by which media?--video teleconferencing does not compare favorably to either face-to-face or audio at the present. Short, Williams, and Christie (1976) conclude

that video teleconferencing is difficult to justify by current criteria: it costs a lot and differs very little from audio in evaluation results. One task for which video currently ranks high is "giving information to keep people in the picture" (V14). In the scenarios, this potential of video to maintain friendly relations is linked to regularity of usage. In the Effective Scenario, regular meetings allow the feeling of "being in touch" to happen. The Ineffective Scenario is characterized by irregularity and perhaps even an overreliance on video to perform this function.

The strongest negative evaluation of video teleconferencing concerns bargaining (V44). Actually, however, video systems have rarely been used for real-life bargaining. Thus, it is possible that this judgment may say more about the difficulty of bargaining than the unsuitability of video teleconferencing for bargaining. Based on current evaluations, though, it seems ill-advised to rely on video for this task. In the Effective Scenario, Owens carefully avoided such a situation by scheduling a separate face-to-face meeting to focus on negotiation. This strategy, of course, assumes that the group could get together face to face and avoids facing the difficult question of how to bargain if all you have is video. Anecdotal evidence from at least one operating video system suggests that effective bargaining by video *is* possible and that perhaps the experimental evidence is misleading. At any rate, our Ineffective Scenario still has Owens charging blindly into bargaining as his very first group task: "Owens started us on a monstrous first task: negotiating the administrative structure for a food distribution plan in Camelia."

IN SUMMARY . . .

While video teleconferencing was the glamour child of telecommunications not long ago, it now seems besieged by bad press. In our opinion, it is still too early to offer a final indictment of video as pure conspicuous consumption. Video has the potential for types of communication which can't be reduced to words or print, and such communication might be crucial in some situations. But video probably has been oversold. As in any other medium, there are communication hurdles here. Overcoming these hurdles may require more--not less--preplanning.

COMPUTER TELECONFERENCING

EFFECTIVE USE

[Excerpt from the Transcript of an Ongoing Teleconference]

5-APR-85 PAGE 1

[1] OWENS 5-APR-85 2:30 PM GMT

I would like to summarize our progress to date. I think we would all agree that, in Part 1 of this conference, we have taken several important steps toward the resolution of the impending crisis in Camelia. First, we have agreed on the data requirements for an emergency monitoring program, and I have now established a separate conference called "Camelia Monitor" that will deal more specifically with these technical issues. All of you will be registered as participants in this conference. Other participants will include scientists from Consolidated, Camelia, and AAB, and three independent universities who have agreed to perform monitoring functions. I am sending their biographies to each of you. I will be holding an "introduction" session from 12:00 to 2:00 P.M. (Greenwich time) on 10 April and 11 April for any of you who want to get to know these newcomers.

[2] OWENS 5-APR-85 2:37 PM GMT

I have also established a parallel "Data Interpretation" conference. The entries in the Monitor conference will be pretty cryptic to most of us. For example, moisture content of soil will be reported in AAB standard units, in the following format:

```
Date 4/07, 6/13, 6/20, 6/27
Plot 37E, 39D, 52, 38E
Map 321E, 321E, 321E, 321E
Moisture .337, .446, .366, .374
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The purpose of the Interpretation conference will be to answer questions about the nature and meaning of the data.

[3] OWENS 5-APR-85 2:45 PM GMT

Second, we have agreed not to launch any immediate relief proposal unless the Monitor conference indicates a rapid deterioration in the Camelian situation. While this decision perhaps increases the pressure on us in this second part of the conference, the Camelians do not want to commit themselves to an emergency program which might threaten the chance of long-term recovery from the drought.

[4] OWENS 5-APR-85 2:51 PM GMT

Finally, in our lengthy debate over objectives, I think we have clarified the major issues which will have to be resolved before any long-term agricultural relief program can be implemented. Mr. Arume has summarized these in entries 514-519 of Part 1; Ms. Dubarieux added two more in entry 530. This conference, then, will focus on long-term relief proposals.

[5] OWENS 5-APR-85 2:54 PM GMT

I would like to hold a synchronous conference on 8 April at 4:00 P.M. (GMT). At this meeting, we should discuss whether to meet face to face to discuss the relief proposals. Any of you who would like to enter your thoughts before then should feel free to do so.

[6] MWANGA 5-APR-85 11:43 PM GMT

I've been on the plains outside of Timbalwe all day and have just returned. I was with Cyprian, and he will report on the installations for moisture testing today or tomorrow.

[7] MWANGA 5-APR-85 11:45 PM GMT

I talked with local officials about precautionary procedures now in effect in most areas of Camelia; they are worried but still hanging onto their optimism. I briefed several gatherings of local officials about our discussions in this conference. They are glad that we are talking, but are puzzled about the role of Consolidated. They are also, of course, concerned about maintaining Camelian independence. It would be very helpful if Consolidated could provide a summary statement of its interests in Camelia.

George Clemmons or Jack Morris, what are the near future plans for Consolidated in Camelia, apart from the drought?

PRIVATE MESSAGE FROM MWANGA TO OWENS 5-APR-85 11:48 GMT

I'm really glad I can visit local groups here during the day and still be an active participant in this conference. If I had to travel to Paris, I couldn't keep in touch with the feelings of our people here or discuss conference topics with them before they are finalized.

PRIVATE MESSAGE FROM MWANGA TO DUBARIEUX 5-APR-85 11:48 PM GMT

Est-ce que je pousse les choses trop loin avec la question que je pose à Clemmons en [7]?

TRANSLATION:
Do you think I'm putting Clemmons too much on the spot with my question in [7]?

PRIVATE MESSAGE FROM MWANGA TO CLEMMONS 5-APR-85 11:50 PM GMT

I'm not trying to put you in an awkward position with my question in [7] and certainly don't want you to discuss matters which you feel are confidential. I do think it is important, though, for you to give the whole group a statement of Consolidated's long-term interests in Camelia, and my question was merely intended to give you an opportunity to do so.

[8] MWANGA 5-APR-85 11:56 PM GMT

I'll continue to join this conference regularly each evening, probably around midnight, my time. My office knows where I am during the day, but it's usually out in the field. Tonight, I have a portable terminal at a base camp 105 miles southwest of Timbalwe.

[9] CLEMMONS 6-APR-85 11:50 AM GMT

Re [7], our position on the relief program should be clear to all. Our opening statement in Part I of the conference set the stage for our involvement in a relief program that would preserve both Camelian independence and the welfare of its people. Our facilities would be made available to support this effort throughout Camelia, and the contractual arrangements would spell out a timetable and a favorable price structure. As for our long-term interests, I think that they are reflected in our general policy of reducing the barriers to exchange of agricultural products among all countries.

[10] DUBARIEUX 6-APR-85 2:30 PM GMT

M. Clemmons, je viens de me reporter à votre déclaration en [192] dans la première partie de la conférence. Dans ce paragraphe vous déclariez que Camélia recevrait le statut de "nation favorisée" parmi les clients de Consolidated après la fin de la sècheresse, en échange de modifications des tarifs d'exportation de Camélia. Une clarification de vos intentions s'impose pour permettre à la LCF et à l'opinion mondiale de évaluer la sincérité des efforts de Consolidated et le plein impact potentiel de l'effort de secours qui pourrait en résulter.

[10] TRANSLATED

Mr. Clemmons, I've just been referring back to your statements in Part I of the conference transcript (entry [192]). In that entry, you stated that you would give Camelia "favored nation" status among the Consolidated clients beyond the duration of the drought in return for changes in Camelian export tariffs. Your intent here needs to be clarified before the LCF and

world opinion can assess the sincerity of Consolidated's efforts and the full potential impact of the relief program which might result.

[11] CLEMMONS 7-APR-85 12:01 PM GMT

With due respect to Ms. Dubarieux, I believe she is taking a passing reference which I made out of context and inflating its importance. Certainly, we are concerned about tariff structures, but I would hope that the LCF would not threaten the workings of these conferences by dwelling on this issue.

PRIVATE MESSAGE FROM CLEMMONS TO MORRIS 7-APR-85 12:08 PM GMT

I wish I hadn't phrased my initial comment the way I did; leave it to Dubarieux to dig it up out of the transcript. Why do you think the Camelians are being so cautious; I thought with half of their people on the brink of starvation, they'd be much more eager to cooperate. I guess we've got to be more careful on this point. Why don't you come in here and reassure them that we are not trying to be crass.

[12] ARUME 7-APR-85 7:01 PM GMT

La suggestion par M. Clemmons de changements dans la structure de nos tarifs représente certainement, à notre avis, une interférence politique si elle est posée comme condition à la participation de Consolidated dans un effort de secours. La question de modifications des tarifs est à l'étude par notre Gouvernement, mais je voudrais qu'elle soit entièrement séparée de toute discussion de la sècheresse et des mesures à prendre. Ce n'est pas ainsi que l'on influencera les structures de tarifs Caméliens!

[12] TRANSLATED

Mr. Clemmons' suggestion for changes in our tariff structure does represent, in our view, political interference if it is a condition for Consolidated's participation in the relief effort. The question of tariff modifications is under consideration by our government, but I would like to separate it entirely from any discussion of the drought and our responses to it. Camelian tariff structures will not be influenced in this manner!

[13] MORRIS 7-APR-85 9:13 PM GMT

Tariff structures are but one of a series of issues which are important to consider in a comprehensive discussion of the Camelian situation. To elevate them in importance would be destructive; to eliminate them from our discussion would be naive.

PRIVATE MESSAGE FROM MORRIS TO MWANGA 7-APR-85 9:20 PM GMT

I hope that Mr. Arume understands that we are just trying to be candid in bringing up the subject of tariffs. We have responsibilities to our stockholders and board, which would be much easier to uphold if we could report both a relief program to Camelia in the short run and a more desirable tariff structure in the long run. I think this is the sort of issue which you and I could negotiate privately without becoming immersed in the formality of the public transcript.

[14] RIBERA 7-APR-85 9:30 PM GMT

I may not make it to the synchronous conference tomorrow. Was finally able to get a meeting with the AAB planning committee tomorrow morning, and don't know how long it will last.

[15] OWENS 8-APR-85 12:02 PM GMT

I think everyone is online now except Dr. Ribera, who won't be able to join us today. But of course he'll see this transcript when he joins later this evening. As I indicated, our first order of business is deciding whether to continue negotiations via this medium or meet face to face. Or of course, we could consider other teleconferencing media. Given the progress we have made via this medium, I think these alternatives may not be necessary.

[16] DRAPER 8-APR-85 12:04 PM GMT

I want to thank Bill Owens and the Kettering Foundation for mailing us the edited transcript of Part I of this conference. I think you did a fine job in a short time. In my opinion, the transcript is one good argument for continuing in this conference.

[17] N'DOLO 8-APR-85 12:05 PM GMT

Les stations de mesure hygrométriques out été établies dans sept emplacements dispersés en Camélia. Elles sout toutes équipées de terminaux pour l'envoi des résultats dans la conférence-moniteur. Nous avons commencé les mesures d'humidité quotidiennement à 7 heures (locales) aujourd'hui. Les donnees hygrométriques que nous obtenons sont pratiquement celles que nous attendions. L'analyse régionale sera finie cette semaine.

[17] TRANSLATED

The moisture testing sites have now been set up in 7 locations throughout Camelia. All are equipped with terminals for reporting results in the Monitor conference. We began sampling moisture content on a daily basis at 0700 hours (local time) today. The moisture data we're getting so far is pretty much as we expected. The area analysis will be completed this week.

[18] OWENS 8-APR-85 12:05 PM

I'm for the computer-based system as we've got it now. But I think we should try to avoid solving interpersonal problems in this medium. Remember when we were having trouble with the LCF data base and we attempted to solve it over the terminal? We were trying to help, but each message came out like judgments in a criminal court. We all rationalized that Helene misinterpreted our statements because she was so protective of the data. But when I went back and read the transcript, I could see how our "helpful" statements could be misinterpreted.

[19] MWANGA 8-APR-85 12:08 PM GMT

I agree with Bill Owens that this conference is working, but I think we should take it really slow, with a minimum of synchronous meetings. Those meetings invite trouble. Someone puts out an idea and by the time someone else responds, three or four other ideas have been suggested. While it may be helpful to have the ideas numbered and written down for easy reference, I don't think anybody can respond thoughtfully to all the suggestions and ideas when they came at you in such a disorganized fashion.

PRIVATE MESSAGE FROM MWANGA TO MORRIS 8-APR-85 12:10 PM GMT

It has to remain clear that we don't have to bargain away our economy in order to survive this crisis! This is where Mr. Arume needs to remain strong. However, there is some negotiation room here if we are not forced into a public statement right away. Let me prepare the groundwork here, and I'll keep in touch through you. I think Mr. Clemmons and Mr. Arume should handle the public debate.

[20] PIERSON 8-APR-85 12:10 PM GMT

For accuracy's sake, I think it might be best to stick to computer conferencing. In other meetings, a lot of technical errors go unnoticed. There are transposals of numbers, missed numbers, misused technical names.

[21] MORRIS 8-APR-85 12:12 PM GMT

Every possible error that can be made in a technical report has been made via audio teleconference, for example. I remember in one of the yearly reports, our people reported that some rice was infected with "Swollen Shoot" which is exclusively a disease of cacao trees.

[22] ARUME 8-APR-85 12:12 PM GMT

I'm willing to continue with this medium, as long as it is working. But I think we should keep the face-to-face option open all the time.

PRIVATE MESSAGE FROM AMPLEBY TO ARUME 8-APR-85 12:13 PM GMT

I just received our latest budget figures for agricultural development aid to Camelia from the major religious denominations: it looks as though you will receive an increase of about 10 percent over last year. That should help, but not much. These figures won't be made public for at least another month. I'm reluctant to mention them now in this conference because they might provide a false sense that the extra money will end the crisis. I'll follow your advice on whether or not to quote it publicly, but I knew you would want to know as quickly as possible. Call me on the phone if that raises any immediate issues.

[23] PIERSON 8-APR-85 12:13 PM GMT

Let me just mention something else, while we're all together. I've been thinking about the crop/climate figures Eduardo and Cyprian entered in the last week of Part I. I showed them to some of my colleagues. Also, I finally dug out the paper from my files which I had relied on so strongly in my arguments. Although I was very skeptical at first, my reflection period and the resources I checked have changed my mind. Your figures seem correct, Eduardo, and I think they can be used as the basis for further planning. I'm glad I was here in my university where I could double check my knee-jerk responses the other day. If I was smart about using this medium, I would have refrained from saying anything until I could check over my thinking. I apologize for the quick response and give my complete support to Eduardo's figures.

PRIVATE MESSAGE FROM MWANGA TO DUBARIEUX 8-APR-85 12:15 PM GMT

Hélène, nous sommes heureux de votre support et de celui du LCF dans la question des tarifs, mais à notre avis il vaudrait mieux ne pas forcer une confrontation avec Clemmons pour le moment. Nous préférons conserver une certaine flexibilité sur cette question jusqu'à ce que les choses soient un peu plus claires. Je vous tiendrai au courant de nos opinions.

TRANSLATION:[10]

Helene, we appreciate the support of you and the LCF on the tariff question, but I think it might be a good idea not to force a confrontation with Clemmons at this time. We'd rather keep some flexibility on this issue until the air clears some. I'll keep you up to date with our thinking.

PRIVATE MESSAGE FROM DUBARIEUX TO MWANGA 8-APR-85 12:17 PM GMT

D'accord, j'attendrai que vous me fassiez sigue. Je crois que c'est un point où Consolidated peut être vulnérable, mais je n'insisterai pas, du moins pour le moment.

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[10] In an actual transcript, no translation would be needed because both Mwanga and Dubarieux speak French. The translation here is solely for the sake of our English-speaking readers.

TRANSLATION:
I'll wait to hear from you, then. I think it's a point where Consolidated might be vulnerable, but I won't press it for the time being at least.

PRIVATE MESSAGE FROM MORRIS TO OWENS 8-APR-85 12:17 PM GMT

I'm glad to see Professor Pierson speaking up in this conference. He is really a strong thinker, but I know he is also very shy in meetings. A colleague of mine attended a large international conference in Montreal where he was also in attendance, but didn't say a word!

PRIVATE MESSAGE FROM CLEMMONS TO AMPLEBY 8-APR-85 12:18 PM GMT

How long are you planning to stay in such out-of-the-way places? I hope we'll have a chance to meet in the States some day. With your talents, you could be doing some really important work back here in your own country. Chuck Davis, our minister here for the last five years, tells me you both were at Claremont Seminary together for a workshop several years ago. Chuck sends his best to you; he is doing a fine job here.

PRIVATE MESSAGE FROM OWENS TO ARUME 8-APR-85 12:18 PM

How is your remote chess game with Allan going?

[24] N'DOLO 8-APR-85 12:19 PM GMT

La téléconference fonctionne bien dans mon cas. Je peux envoyer mes rapports à n'importe quelle heure, en garder un enregistrement permanent, et vérifier la précision de ce que j'envoie. Cela nous permet de traiter avec objectivité une grande masse de données.

[24] TRANSLATED
Computer conferencing works well for me. I can file my reports at any time of the day, have a permanent record, and can check to see if what I am sending is accurate. It enables us to deal objectively with a mass of data.

PRIVATE MESSAGE FROM ARUME TO AMPLEBY 8-APR-85 12:20 PM

We can certainly use the increased aid, but it won't be enough. I don't think it would be appropriate for you to mention the new budget in the public record, especially since it is not "official" yet [sic]. I appreciate your continued support, Bishop.

[25] CLEMMONS 8-APR-85 12:22 PM GMT

I don't think anyone will argue that this conference has been fine for dealing with the technical information. If we can keep the discussion focused for the negotiations, I think it will work. But if not, we'll have to try something else.

PRIVATE MESSAGE FROM ARUME TO OWENS 8-APR-85 12:23 PM

He's got me in a tight spot, but I think I have a strategy to beat him. Thanks for telling me that he liked chess. It helped bridge the gap between his culture and mine.

[26] OWENS 8-APR-85 12:25 PM GMT

Well, it seems like a consensus, but I'll call for a vote just to make it official.

[27] [RE 25] 8-APR-85 12:30 PM

Shall we continue the computer conference for Part 2?
Number of votes:

Yes:	10
No:	0
Abstain:	0
Absent:	1

COMPUTER TELECONFERENCING

INEFFECTIVE USE

MEMO TO: Representatives to the African Agricultural Board

FROM: Eduardo Ribera

SUBJECT: THE CAMELIAN RELIEF CONFERENCE

By now, I trust all of you have received the full 4-volume, 2,200-page transcript of the Camelian conference, together with my official summary of the results. My purpose here is to clarify the procedural problems which plagued the conference.

When Bill Owens of the Kettering Foundation first suggested to me the idea of a computer conference to link the principals in the Camelian controversy together with access to economic and agricultural models, I was indeed optimistic. As you know, our organization has been using integrated modeling/conference systems to support its internal decision-making for a few years now, with some very satisfying results. The Kettering proposal was to have been an extension of this idea; representatives of several different viewpoints could negotiate a common relief program with the support of the best knowledge available. Online models could forecast the possible impacts of alternative strategies as they were introduced. And the discussions could be conducted over a period of time which would allow careful consideration of all of the alternatives. Unfortunately, my optimism proved unwarranted.

In retrospect, I can see that the basic flaw in the conference was the overemphasis on the value of information in solving a culturally complex problem. With one or two possible exceptions, we failed to acknowledge the importance of the interpersonal aspects of the meeting--the building and maintenance of alliances. We tried to ignore the kind of interpersonal

diplomacy--both delicate and dramatic--which is the stock and trade of most of the people who participated in this conference. As a result, alliances were formed in private messages, when formed at all. There, they were hidden from view, so none of us ever really knew just what kind of a group we were. We debated with lots of computer-printed words, but seldom with other people.

I think everyone approached the conference with the same optimism as I did. Unfortunately, they also approached it with very different perceptions of what the problem was. I certainly viewed the problem as an economic one: some of us needed food and some of us had it to "sell" at some price. Of course, it was more complex than that, but I thought we could probably model the economic consequences of alternative relief proposals for Camelia, for the Board, and for the farmers which Consolidated represents. However, in reading over the transcript, I can see that Draper, for example, wasn't really interested in economics beyond the cost of delivering food to the hungry and dry-zone seeds to the farmers. On the other hand, Arume--and I think this is quite typical of our African leaders--kept probing cultural and social consequences five years down the pike. Unfortunately, I didn't recognize these differences until the last few days of the conference. It was structured so rigidly that we never had a chance to get basic concerns out in the open.

Owens opened the conference with a series of questions which he thought should be addressed and then led us lock-step through each question in turn. The first few were climatogical questions, and the troubles started here. The Americans had an online file of weather and crop data for Africa that didn't agree with the Camelian data. We ran the Kettering model on both. Then Pierson spent two weeks arguing with N'dolo about the results. (Pierson actually resembled a tinker in a toy shop, perturbing the model this way and that and hardly acknowledging the rest of us.) Owens rescued us from that fire and tossed us into another--the economic consequences of the drought.

I must admit that I probably looked something like a tinker, too, when we ran the economic models. But I had some company. Francoise Mwanga and Jack Morris really did some fine analytical work in interpreting the

results of the AAB model. But then Helene Dubarieux began questioning the model's assumptions--the most fundamental economic concepts in some cases. We tried to respond to her first few questions by altering some of the model algorithms, but we didn't really know what we were doing and the flood of new data from the revised model was overwhelming. I'm afraid we just ignored Ms. Dubarieux's questions after that (it's so easy to do in a computer conference), and she understandably became quite belligerent. We finally reached a complete impasse when there was more data than any of us could absorb! Owens then led us to the next question.

By now, the original high expectations of the participants--soured by controversy over the data--had been transformed into distrust of the motivations of others. And several factors produced a further deterioration in trust. One of the most serious was the unevenness of participation. Some people responded to new entries every day. Others responded only irregularly. I have seen this happen in other computer conferences, too. People are busy or not particularly interested, and they just don't log in. Since there aren't equivalents to a ringing telephone or even regular meeting times in computer conferences, there's really no way to get them into the conference. Then, when they do come in, they are so far behind that they have a lot of reading awaiting them. Faced with this burden, they enter some trite remark, log out, and then don't get back in for several days more. It really is frustrating for those who participate regularly.

In this case, the unevenness was more than just frustrating. This was a very political group, and nonparticipation in such a group is often interpreted negatively. Clemmons was the most serious offender. Looking back on it, I think he was probably speaking through Morris. But most of us felt that his lack of participation was a statement of his disdain for our "petty problems."

Another factor threatened the group's basic trust level--the private message mode. The public transcript of this conference was dominated by debates about resources and technologies which obscured the personal motivations and objectives of the participants. Owens spent all his time trying to reconcile the mathematical results, out of a mistaken belief that the other problems would go away if we could just agree on one set of numbers. But some of the others began to use the private message mode to

pursue their personal objectives. Draper was one. From the very beginning, he sent me humorous notes about the heavy rain in Paris and asked me about good places to eat in Lagos. Frankly, those were about the only pleasant exchanges I had during the whole conference. Of course, it became clear during the voting that he was using it for more than pleasant exchanges. He had managed, in spite of Owens' obsession with *data*, to build a coalition of *people*.

The voting. Here again, Owens' rigid structure inhibited any real communication. We were discussing the roles of different agencies in a possible relief program. We began with the LCF. Morris was bombarding us with messages about the technical expertise needed to oversee a relief program, implying that LCF just didn't have that kind of expertise. Dubarieux responded with miniphilosophies on the ethics of the situation, accusing Consolidated of a "food blackmail." Arume really tried to facilitate the debate to avoid polarizing the conference. But Owens grew impatient with the confusion. He decided that we would spend only 30 messages on each agency, after which he would call for a vote. If we had been meeting face to face, I think Arume would have flown into a powerful rage. But in this medium, his anger over being forced into a premature vote came across only as a hopeless objection. He's a powerful orator, but in computer conferencing even the best orator can't keep the group's attention.

The final blow, of course, came from the series of anonymous entries made by a person claiming access to secret weather modification data. This user of the system--who must have been one of the delegates--called himself (or herself) Hungry Jack and accused the United States of having accidentally caused the African drought in covert attempts to alter climate patterns over large sections of Communist Asia. All trust was gone then, and computer conferencing simply offered no suitable channels for recovery.

It was a disappointing failure. For all that computer power--all of the models and data--there was very little negotiation, very little change in the viewpoints of participants. I think the lesson here is that it takes more than technology to solve a problem like this. What was supposed to be the ultimate information system proved to be a disinformation system.

COMPUTER TELECONFERENCING
ANALYSIS

Computer conferencing is an unfortunate label for this medium: the computer should ideally remain in the background, invisible to the user. Furthermore, "conferencing," too, may be a misleading designation; other types of communication can also occur through this medium. Essentially, computer conferencing is print-based communication which does not require all participants to be present simultaneously. And such *written, asynchronous* communication changes many of the rules for small group meetings.

PARTICIPATION WHEN YOU WANT, *IF* YOU WANT

A major advantage of computer conferencing over other teleconferencing media is its flexibility of participation times. Conference organizers can avoid all of the problems of scheduling usually associated with "meetings." Participants can maintain their normal routines and participate at their own convenience. This flexibility may be more than convenient; it may improve the quality of the meetings as Francoise Mwanga observes in her entry in the Effective Scenario:

> I'm really glad I can visit local groups here during the day and still be an active participant in this conference. If I had to travel to Paris, I couldn't keep in touch with the feelings of our people here or discuss conference topics with them before they are finalized.

Unfortunately, the leader cannot just invite the participants and expect them to carry the ball. The self-activated nature of the medium means that participation may be irregular (C34),[11] particularly if the need to communicate is not clear. Computer conferencing has no equivalent of a ringing telephone, no gavel to bang to call the group to order. Thus, the group may feel frustrated by the lack of immediate feedback, which can give computer conferencing an impersonal quality (C46, C54). Questions may go

[11] The codes in this analysis refer to the numbers of the "strengths" and "weaknesses" listed for each of the media in the Summary of Social Evaluations of Teleconferencing in the Reference Materials. Thus: V for video, C for computer conferencing, etc.

unanswered (C30, C47) as did Helene Dubarieux's questions about model assumptions in the Ineffective Scenario. In the extreme, irregular participation may threaten group trust. When George Clemmons was inactive in the Ineffective Scenario, for example, the group felt that it was "a statement of his disdain for our 'petty problems.'" An organizer of a computer conference needs to begin with a strong commitment from each participant and then consistently shepherd those who lag behind. Thus, in the Effective Scenario, Owens sent a discreet private message to Clemmons, asking him to urge Morris to participate more regularly.

THE WRITTEN WORD

Of course, the key to the flexibility of this medium is the existence of a printed transcript, always available for review. Aside from the convenience of having an ever-current record of the conference, we assume that it may provide a tool for manipulating the communication in either good or bad ways. Dubarieux seems particularly skilled in this use of the medium, challenging Clemmons with one of his earlier statements:

> Mr. Clemmons, I've just been referring back to your statements in Part I of the conference transcript (entry [192]). . . . Your intent here needs to be clarified before the LCF and world opinion can assess the sincerity of Consolidated's efforts. . . .

Dubarieux is effective in pressing Clemmons on this point. However, this situation demonstrates why potential participants may be reluctant to use computer conferencing in a situation such as this. They may *not want* people to refer back verbatim to their earlier statements (C32).

INFORMATION, BUT NOT TOO MUCH

For some tasks, though, the written word makes computer conferencing a hands-down winner. The management of technical information is such a task (C14, C15, C17, C20). In the Effective Scenario, for example, Owens establishes a parallel data collection conference, and Pierson testifies to the superior accuracy of the medium for communicating technical information. Also, since computer conferencing allows more time for deliberate,

reflective responses (C3, C17), the quality of the information exchange is likely to improve: Pierson first disagrees with N'dolo's crop/climate figures in the Effective Scenario, but after checking his resources, confirms them, and the group is able to move on.

Carried to a logical extreme, the ability of computer conferencing to deal systematically with large amounts of information suggests that it might be very effective in solving global crises as they develop (C18). However, the Ineffective Scenario portrays an abuse of this hope: an overreliance on the value of the information accessible via computer conferencing and an underemphasis on interpersonal communication:

> Owens spent all his time trying to reconcile the mathematical results, out of a mistaken belief that the other problems would go away if we could just agree on a set of numbers.

Owens appeared determined to "structure out" interpersonal communication in this scenario. He rarely used the private message mode, where we suspect much less formal communication occurs, and led the participants lock-step through question after question, calling for votes with little opportunity for debate or diversion. Furthermore, he allowed the volume of information to get completely out of hand. A four-volume, 2,200-page transcript is surprisingly easy to produce, but may be impossible to decipher. It's hardly surprising then that one participant, frustrated by the inability to communicate, resorted to a destructive anonymous attack: Hungry Jack, with his accusations against the United States, dealt the death blow to the conference. Thus, computer conferencing, overstructured and overwhelming, proved its potential as a disinformation system.

By contrast, the successful Bill Owens used structure moderately and encouraged interpersonal communication, even laying the groundwork for a remote chess game between Arume and Draper. There is a real question whether computer conferencing *alone* can provide the opportunity for delicate interpersonal diplomacy. There is some evidence that written messages are more persuasive than those transmitted orally (C1, C2). However, it is obvious that voice media allow more messages to be exchanged and more flexibility in the interaction (C28, C29, C31). A blend of public and private messages, with other media used occasionally, seems crucial in a situation such as this.

BOTH PUBLIC AND PRIVATE

In the Effective Scenario, Owens encouraged a dynamic use of both the public and private mode, revealed in the synchronous meeting. Public and private communication were occurring simultaneously--the latter being of prime importance. In the private mode, Morris and Mwanga were negotiating, with Dubarieux assisting Mwanga. Ampleby and Arume exchanged information about the latest aid figures and decided not to make the information public. Meanwhile, on top of the table, business was proceeding, too, as the group decided to postpone a decision on a face-to-face meeting. While the private negotiations were hidden, we believe that they were probably reflected in the public interaction. Furthermore, we suspect that, while the group didn't know *how* alliances were being formed, they at least recognized that they *were* being formed.

Owens' approach in the Ineffective Scenario allowed no such group sense of alliances. And his indifference toward the private message mode opened the door for its manipulation by Draper. As Ribera explained:

> From the beginning, he sent me humorous notes about the heavy rain in Paris and asked me about good places to eat in Lagos. Of course, it became clear during the voting that he was using [private messages] for more than pleasant exchanges. He had managed to build a coalition.

Meanwhile, in the public mode, most of the group members were simply struggling with presenting their viewpoints in a straitjacket structure.

SELF-PRESENTATION IN PRINT

In computer conferencing, all of the splendor of self-presentation is funneled into the single channel of print. Some people respond gloriously to this concentration of communication and fully exploit the printed word. Shy Glenn Pierson, for example, adapts well to this medium in both scenarios (although the emphasis on data encourages a "tinker in a toyshop" image in the Ineffective Scenario). Others, like Arume, may find computer conferencing inherently limiting: "He's a powerful orator, but in computer conferencing, even the best orator can't keep the group's attention."

There is evidence that computer conferences encourage more equal participation than other media (C23, C24). This observation is speculative, but we feel confident that people who are socially uncomfortable and easily dominated in other media can play a more dynamic role in a computer conference. Mwanga is a case in point. She participates aggressively in the public conference and probably has more impact in the private mode than we can imagine in any of the other media.

Some personal skills seem to have surprisingly little effect in computer conferencing. The ability to type does not seem to be as large a barrier to participation as one would at first assume; nor is computer expertise (C25, C26, C27). While such skills might add to a participant's abilities via this medium, there is no evidence to suggest that they are major inhibitors. And as computer conferencing systems become more simple, this situation can only grow better.

IN SUMMARY . . .

Computer conferencing provides a lot of technological structures for controlling group interaction, but few of the familiar social structures. Training people to use the system will be technically easy but socially difficult. We feel it would be a mistake to rely on the technology to direct the communication process--either by imposing highly structured formats or just using it as an open forum. Leadership is no less important in a computer conference than in face-to-face communication. Our prescription is strong, but subtle leadership.

AUDIO TELECONFERENCING

EFFECTIVE USE

MEMO TO: Human Relations Office, Project Progress

FROM: Allan Draper

DATE: 13 March 1985

SUBJECT: CONCLUSION OF THE CAMELIA FACT-FINDING TELECONFERENCES

You have each seen my final report on the Camelian Fact-Finding Teleconferences by now, but we can learn some lessons from the techniques that were used to deal with this potential crisis, and they deserve a separate, informal note.

When Bill Owens of the Charles F. Kettering Foundation organized these meetings, he decided wisely to use a mix of face-to-face meetings, audio conferences, and one-to-one telephone calls. Early in January, we all met for a two-day face-to-face session on the north coast of Africa to develop an inventory of relevant information and establish a preliminary agenda. This meeting also gave us a chance to get to know all of the participants. Owens had done some fine work researching the mythology of food in different cultures and presented it as part of an opening statement. This presentation, together with the attractiveness of our host culture, set the tone for a cooperative initial meeting. There was no pressure to *solve* the problems here; instead, we discussed in some detail the protocols and schedules for a series of audio meetings. And we emerged with a set of reasonable goals.

The audio teleconferences were well orchestrated; there was careful preplanning, but informal exchanges were also encouraged. At the start, Eduardo Ribera, Glenn Pierson, and Cyprian N'dolo attempted to resolve the differences in information about the drought. They conferenced intensively over the telephone for two weeks, occasionally bringing together some

of their colleagues for 4- and 5-person teleconferences. Ribera and Pierson certainly made good use of the facsimile capability for exchanging charts, graphs, and sections of reports. They weren't completely successful in resolving the discrepancies, but they did close the gaps considerably.

Then, as our leader, Owens decided that it was time for the rest of us to go to work. Our task was to determine the consequences of the drought. None of us wanted to leave this task to a pair of "objective" experts. We had agreed at the face-to-face conference to divide into committees to assess the consequences, since 11 people trying to assess the whole range of economic, political, and agricultural impacts of drought would likely prove too complex and unmanageable for an audio conference. I spent two weeks in regularly scheduled teleconferences with Cyprian N'dolo, Jack Morris, and Helene Dubarieux assessing the economic consequences of the impending drought, based on the forecasts developed by Ribera and Pierson. We "met" every two days to pool our individual interpretations. And at the end of two weeks, we had a general statement of the likely impacts for Camelia, for the African Agricultural Board, and for Consolidated. (If the frequency of these meetings seems burdensome, imagine the amount of time that might have been consumed in a face-to-face meeting. These were discussions which required a lot of preparation, and I am not at all sure that they could even have been carried out as quickly as we did here if we had met face to face.)

I learned at least one important lesson during these subcommittee meetings. One problem that was upsetting to me was N'dolo's frequent interruptions. At one point, he cut off an important presentation by Morris to launch into a largely irrelevant discourse on local affairs. In an audio teleconference, of course, all the communication is funneled into voice exchanges, so I had difficulty telling whether the frustration I was feeling was related to the medium or to N'dolo himself. I had a lot of trouble listening to what he was saying because he annoyed me so much. I was on the verge of shouting at him when I remembered my training in cross-cultural communication and started thinking, "Why am I upset?" I soon began to realize that N'dolo didn't know the cultural intricacies of arguing in English. I had to get over the idea that the guy was being crude and remind myself that in most African cultures the etiquette for interaction with

strangers is very different. Perhaps I appeared crude to him. I began to understand how his standard of etiquette was coming across via this medium. Gradually, I found that I could listen to what he was saying and agree or disagree on the basis of the data instead of on the basis of my reaction to what (in my culture) would be his rudeness. The translator Owens had arranged for was a big help in this process, since she also had training as an anthropologist and did more than mechanically translate the words of the participants. On several occasions, I asked her advice privately.

After we had all had a chance to review the reports of each committee (which were limited to 10 pages), we met as an entire group for a series of information exchange meetings via telephone. These audio conferences were scheduled for 45-minute periods every other day at 7:00 p.m. Paris time. The meetings were formal and efficient. The experts served as a panel for the first three sessions. The rest of us were called upon by Owens (in varied orders) to ask any questions we might have regarding the first committee's report. Translators were again present, and we also recorded all of the sessions. In addition, our graphics capability helped bridge some of the language problems since visual aids seem to be more universal than language in some ways. We then went on to the other two committees. Meanwhile, all of us were trying to formulate in our own minds the best strategies for coping with the Camelian predicament.

We gradually realized, however, that "coping with the Camelian predicament" meant different things to different people. I kept pressing for an immediate relief program and found it initially perplexing when Arume went on and on about what would happen *after* we succeeded! With the help of Owens, the translators, and Francoise Mwanga, it gradually became clear that there were different cultural perspectives here and that it was important not to press for an immediate solution before the Africans had fully discussed all the social implications of the plan. Mwanga, in particular, served as a bridge person since she had exposure to both perspectives. At the initial face-to-face meetings, she was so retiring in the presence of Arume that I barely noticed her. But over audio, where people listen more to what you say than how you say it, she made significant contributions to our understanding of the Camelian cultural perspectives.

If this understanding had not developed, the meetings would have been a failure.

George Clemmons of Consolidated also seemed disturbed by the apparent slowness on the part of the Camelians, and at one point, it was obvious that he was beginning to lose his patience. Meanwhile, Helene Dubarieux of LCF made some piercing statements about similar situations in other developing countries and the programs which had been implemented there. These statements only made Clemmons more uncomfortable, since Consolidated was sometimes presented as less than well-intentioned. I remember at one point, just when Clemmons seemed on the verge of exploding, Owens adjourned the teleconference. I'm sure he called Clemmons on the telephone afterwards to calm him down and hold the meetings together. The audio medium did little in itself to keep the diverse perspectives together; the important element was Owens' leadership and sensitivity to the roots of conflicts as they emerged.

On the other hand, some people seemed perfectly comfortable with this medium. Eduardo Ribera, for example, shone in these meetings. He is extremely near-sighted and cuts a rather pitiful figure in face-to-face meetings; but he has an impressive range of expertise, and he was able to utilize it fully over the audio system. There was a brilliant exchange of scientific arguments between Ribera and Pierson during one session; it eventually led to a timetable for setting up a monitoring program with the help of Consolidated field personnel and the missionaries.

After the discussion of consequences, there was a lull in the audio meetings while we all worked on developing strategies for relief. Owens encouraged us to communicate with each other individually during this period. I really thought this approach was dangerous; I fully expected some "hidden" negotiation and bargaining, but Owens emphasized the importance of keeping in touch with everyone. The plan was to have a statement of goals as well as written strategy documents circulated to all participants by March 15 when we are to meet again face to face.

As the audio meetings came to a close, I met Owens for dinner in Paris, and we talked about them. We both agreed that the initial face-to-face meeting had been crucial in whatever success we achieved. For one thing, it

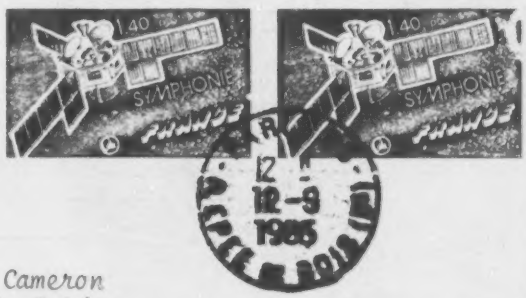
provided the group with a manageable set of goals. It also allowed the participants to get to know each other, to get a sense of themselves as a group. Such a feeling would have been difficult to achieve otherwise, given the impersonality of audio and the fairly rigid social protocol which the audio system demands.

Then, too, the teleconference meetings offered some important advantages. They served as an equalizer, reducing the impact of the more dominant personalities which had asserted themselves at the face-to-face meeting. Everyone had the opportunity to express him- or herself in a disciplined fashion, either to the group as a whole or to individuals. The formality of audio conferences had its drawbacks, but it allowed participants to prepare in advance and remain on their "home turf," so they were both more competent and confident. It was interesting to learn from Owens that he had been prepared at any point to switch to another conferencing medium. He confessed that he was indeed worried about the formation of coalitions. Had any breakdowns in communication occurred, he said, he would have attempted to call us together face to face as quickly as possible or would have taken off on his own rounds of "shuttle diplomacy."

AUDIO TELECONFERENCING

INEFFECTIVE USE

Helene Dubarieux
5 Square Petrelle
75009 PARIS



Ms. Amy Cameron
31 Canute Road
Faversham, Kent
ME13 8SH
England

March 10, 1985

Dear Amy,

I have been reviewing the tapes of my recent meetings on the Camelian crisis and thought I should share my reactions with you. I wanted to figure out why they failed so miserably and to see if there weren't some clues there about strategies for the future. And since you may face similar meetings in the future, you might benefit from my experience.

It is truly amazing to note how much time we spent arguing over protocol. I have been to many conferences in which there were procedural debates, but never have I participated in a group which spent so much of its time trying to organize itself--and with so much unrelieved confusion. There are some explanations, of course. For an audio conference, there were too many people for the flimsey structures we had to guide us. Do you know how many goals Bill Owens presented to us at that first session? I counted 10 when I reviewed the tape. Unfortunately, his "democratic" style of leadership left us with collective responsibility for setting up the agenda. Thus, we not only had to argue over how bad the situation in Camelia really was or whether Project Progress should administer the relief program, but we had to argue over whether we were going to discuss how bad the situation was and how a relief program should be administered.

Even when we seemed to agree on an issue, there was something which was not quite right. It was as if the differences in cultures and worldviews of the participants would not allow us to get down to the real issues. Clemmons--and some of the rest of us too--thought we might be able to sidestep the cultural differences in order to work more quickly toward a resolution. When Abu Arume or others resisted, Clemmons just kept pushing his ideas for quick action. Owens stayed in the background, as if he was afraid to get involved. Looking back on the meetings, it seems like each of us was interpreting what was happening in different ways. There was no structure to help us sort through these varied perceptions. Without such assistance, the audio medium invited us to ignore those cultural differences and press on in our own scattered directions.

In the end, I guess we chose the wrong goals. Trying to negotiate a joint strategy for agricultural development of Camelia was just too complex. We were glutted with cultural, political, economic, and technical problems but starved for usable information about those problems. I remember being truly confused in trying to sort out all of the points that different people were making--not to mention separating fact from rhetoric. It just goes by you too fast over audio.

Another problem was that many of us had never met before. This made it really hard to get a sense of who our allies were, so sometimes we

really fumbled in the strategic debates. I must confess that I suspected all kinds of secret coalitions against me, especially when I overheard parts of side conversations at other locations. And the audio medium seemed to give me an uncommonly defensive feeling toward just about everyone. I don't think that would have happened if we had met face to face at least once. I also think part of my feeling was due to the "impersonal" character of audio. I never had the sense that I was communicating with real people; they were just ideology machines. As people, we might have had a chance, but as isolated ideologies, we definitely did not.

The meetings themselves were almost painful. Two hours of audio teleconferencing is tiring when only two people are involved. But when 11 people are engaged in an emotional debate, the attention demanded by that electronic box is just too much. It's almost impossible to concentrate that hard for that long. And the language problem only made things worse. Several times, the translations actually introduced misunderstandings. At one point, Jack Morris responded to my appeal to consider the ill effects of the Consolidated warehousing system in West Africa. Through the translator, he said: "Nous n'en sortirons pas sans une nouvelle conference mediatisee." Because I understood his English, I knew that he was suggesting an additional teleconference to resolve the problem. But Arume believed him to say that we couldn't solve the problem without a mediator, which he felt was an insult. It took me almost 10 minutes to convince him that the problem was a linguistic one. There simply is no direct translation for teleconference in French, and the translator had, rather insensitively, translated it as a "mediated conference." In addition to the ill feelings it created, the translation problem placed me in the awkward position of having to give the Camelians a French lesson in front of all the others.

Even when the translations were accurate, they were tedious. I don't know how long we sat through the translation of Pierson's technical report on climatological changes. The translators had to keep asking him to repeat to make sure they had the details right. (He was a strange person anyway. He seemed almost uninterested in the conference. Do you suppose he was just terribly shy? Since there was no formal structure for him to

be recognized, he may have been reluctant to just speak up if he were not pretty confident with himself in this medium.)

Now that I think about it, the notion of being simply "on call" for three weeks was absurd. It just added to the hostility to have to wait when someone couldn't be reached. We really needed better scheduling. For example, on the 15th of February, I was notified at 8:00 a.m. that there would be a conference at 11:00 a.m. At 11:55, Bill Owens called to say that 3 of the 10 participants could not be reached. I asked who they were, but he declined to tell me. He rescheduled the meeting for 4:00 p.m. At 4:00, everyone was on except Francoise Mwanga, the Planning Director from Camelia. Arume apologized for her, explaining that she had felt it necessary to miss this meeting. I think we were all irritable and a little distrustful since we didn't know who had been missing earlier, and we weren't sure now that Arume was telling the truth about Mwanga. So when N'dolo mentioned the impending allocation of new funds--the Americans clearly knew about these, but I certainly didn't--I demanded to know the details. Clemmons apparently felt I was trying to delay the discussion and literally shouted me down before hanging up! I was so insulted that I, too, hung up, vowing an end to my participation. I am sure Owens still feels that the failure of the conferences was my fault. He claims that Clemmons was inadvertently disconnected. I am still not sure that I believe that.

I do know that the meetings never really recovered from that breakdown. When we finally went along with Owens' urging to reconvene a week later, it was hard to know where to start. I think there is more awkwardness and hesitation on those tapes than on any of the others. Slowly, we began raising all the old issues of the seriousness of the drought and whether we should really attempt a full-scale relief program or simply a stop-gap measure. But under the specter of another breakdown, we all seemed unwilling to risk sustained debate. Even when we did seriously attempt to pick up the main discussion threads, our recollections of what had been said earlier differed. The discussion jumped from topic to topic, now characterized more by disinterest than by hostility. I don't think any of us saw opportunities for arriving at a joint strategy at that point.

And without such an objective, there was little motivation to communicate. An interlude of personal communication might have helped, but it wasn't possible. After all, we did not really know each other as persons. Clemmons and Morris were the first to withdraw, explaining that they had urgent matters to attend to. Owens struggled to schedule a meeting again two weeks later. I told him it wouldn't be possible for me. Several others said the same. We ended as strangers.

I know that Owens will have a hard time reporting his results. He'll probably say that the meetings opened a dialogue among the important parties. That's a nice way of saying nothing was accomplished. Furthermore, no "dialogue" has been opened! I am tempted to blame this failure on the audio medium, but we didn't really make very intelligent use of it.

So the crisis in Camelia continues. But I refuse to accept the monotoned refusals of Clemmons. (I can imagine what that guy must look like in person!) I believe the LCF should continue to place first priority on the struggle to meet the demands for the health and dignity of the Camelian people! I am arranging a lead article exposing Consolidated in the next issue of ACTION ET PENSEE, and LE MONDE has decided to publish my letter to the editor pleading for a diplomatic intervention by the French Government in this whole issue. Please let me know if you have any ideas about how we should proceed.

Sincerely,
Helene Dubarieux

AUDIO TELECONFERENCING
ANALYSIS

Audio teleconferencing is a voice-only medium. While it can include a graphics-sending capability, most of the communication occurs through a single, audio channel. This essential feature of the medium means that many of the nonverbal signals assumed in face-to-face meetings are missing in an audio teleconference. Such lack of visual information does not necessarily inhibit communication (A1-A10);[12] in fact, for some kinds of communication, an audio-only channel may offer subtle advantages (A17-A23). However, for complex communication situations, organizers of audio conferences will have to guard against an increased potential for misunderstanding.

WHO'S OUT THERE?

With no visual clues, speaker recognition and order of speaking create a "who's-out-there" problem in audio teleconferencing. It is not surprising, then, to learn that audio works best when participants have met face-to-face before they begin to teleconference (A8, A39-A42). In the Ineffective Scenario, Helene Dubarieux experienced this finding:

> Another problem was that many of us had never met before. This made it really hard to get a sense of who our allies were, so sometimes we really fumbled in the strategic debates. I must confess that I suspected all kinds of secret coalitions against me, especially when I overheard parts of side conversations at other locations.

Furthermore, if current studies are to be believed (A60, A61-A63), most people are initially negative toward audio teleconferencing. Thus, as organizer of the Camelian conferences, Bill Owens had to overcome these initial hurdles *before* the teleconference began. In the Effective Scenario, he chose to hold a two-day face-to-face meeting prior to the audio meeting--an opportunity for participants to get to know each other without immediate

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[12] The codes in this analysis refer to the numbers of the "strengths" and "weaknesses" listed for each of the media in the Summary of Social Evaluations of Teleconferencing in the Reference Materials. Thus: V for video, C for computer conferencing, etc.

pressures for solving the problem. He also talked with the participants individually by telephone. Such mixes of media seem particularly important in audio teleconferencing.

The "who's-out-there" problem is also reflected in the feeling that audio lacks a sense of interpersonal contact; it is often seen as impersonal (A43, A44, A47, A49). If this impersonal potential is not countered (in the Effective Scenario, Owens encouraged private phone calls among group members), it will not be surprising to find that the participants feel isolated from each other. Or, as Helene explained, they may all become just "ideology machines."

We speculate that the impersonal quality of the medium may also increase the potential for cross-cultural misunderstandings. Thus, in the Effective Scenario, Draper discussed his reactions to N'dolo: "I had a lot of trouble listening to what he was saying because he annoyed me so much. . . . I soon began to realize that he didn't know the cultural intricacies of arguing in English."

In general, audio conferees will probably spend a lot of time organizing themselves (A56): "Never have I participated in a group which spent so much of its time trying to organize itself--and with so much unrelieved confusion," Helene reported. And the confusion may be more inhibiting for some than for others. For Glenn Pierson, the audio medium made it even more difficult than usual for him to overcome his inherent shyness. It was easy for him to feel off by himself and cautious about participating in the Ineffective Scenario. It is no surprise that Helene found his behavior confusing: "He was a stránge person anyway. He seemed almost uninterested in the conference. Do you suppose he was just terribly shy?" By contrast, the preplanned group structures in the Effective Scenario were intelligent counters to these kinds of problems.

Of course, the lack of a visual channel may be a boon to some participants. In the case of Eduardo Ribera, audio teleconferencing was a good match for his communication abilities: "He is extremely near-sighted and cuts a rather pitiful figure in face-to-face meetings; but he has an impressive range of expertise, and he was able to utilize it fully over the audio system." Ribera's near-sightedness would be an obvious problem via

visual media, but he shone in the voice-only mode. He had more control over his environment and that part of himself which he presented to others. He was an effective speaker who was well prepared, and these strengths carried him through.

EFFICIENT . . . AS LONG AS IT'S SIMPLE AND SHORT

The key word in planning audio meetings is *brevity*. The concentration of communication into the voice channel means that the participants focus their energies, and it seems that they tire easier than when using visual media (A20, A24, A26, A27). Thus, Draper claimed that: "These audio meetings are just exhausting if they go much beyond an hour." A smart leader will schedule short meetings, with increased frequency if more time is needed. Long meetings, a mistake in any medium, are deadly over audio.

If brevity is critical, so is *regularity*. Like most other conferencing media, audio requires that all participants be present simultaneously. The scheduling problems inherent in this requirement range from substantial to nonnegotiable. In the Ineffective Scenario, they contributed to the breakdown of trust: "At 11:55, Bill Owens called to say that 3 of the 10 participants could not be reached. . . . I think we were all irritable and a little distrustful since we didn't know who had been missing. . . ." Bill Owens made a wiser choice in the Effective Scenario, scheduling regular, short meetings.

Simplicity is also an important guideline. The general wisdom from the evaluation literature is that audio teleconferencing is effective for information exchange, discussion of ideas, simple problem-solving, and similar tasks (A6-A8). The key here seems to be simplicity: audio is very effective for simple tasks but becomes less desirable as tasks become more complex (A36, A53). In the Ineffective Scenario, Helene felt that:

> Trying to negotiate a joint strategy for agricultural development of Camelia was just too *complex*. We were glutted with cultural, political, economic, and technical problems but starved for usable information about those problems. I remember being truly confused in trying to sort out all of the points that different people were making--not to mention separating fact from rhetoric. It just goes by you too fast over audio.

Again, an effective Bill Owens unscrambled some of the complexities by dividing the group into subgroups with more narrowly defined tasks.

NEGOTIATION: MAYBE, MAYBE NOT

A crucial uncertainty in audio conferencing is negotiation. A series of laboratory experiments with negotiation simulations have concluded that audio may have distinct advantages over visual media. In particular, the findings suggest that audio may allow conferees to concentrate on the substance of the negotiations rather than the interpersonal dynamics (A17-A21). Also, people do seem able to sense the other participants accurately, for instance to detect lying or to assess another person, although they may not be as confident in their assessments (A22, A23, A32, A64). Thus, Bill Owens *did* make careful use of audio for negotiation in the Effective Scenario--while ensuring that the subject matter was not overly complex. On the other hand, the Ineffective Scenario involved full-scale negotiation which, we expect, will not be effective via audio.

While audio may have some unique strengths for negotiation, the same experiments also reveal a ghost in the closet: there seems to be a higher probability of total breakdowns in negotiation via audio than via visual media (A38, A48). Thus, the limited results to date suggest that audio for negotiation is a risk of extremes: if the negotiations don't succeed, they may break down completely. Such a finding is clearly speculative at this point, but is a prime reason behind the conservative use of audio for negotiation in the Effective Scenario.

IN SUMMARY . . .

In summary, the inherent characteristics of audio teleconferencing underscore the need for leadership. In the Effective Scenario, Bill Owens was a strong, organized leader; the meetings were "formal and efficient." Of course, these highly organized meetings could become *too* organized, but an overly "democratic" leadership is more likely to produce confusion than communication in an audio teleconference.

FACE-TO-FACE CONFERENCING
EFFECTIVE USE

MEMO TO: Camelian Office of Protocol
FROM: Francoise Mwanga

SUBJECT: CAMELIAN RELIEF CONFERENCE

Several of you have asked for a summary of the two-week meeting which produced the drought relief plan we are now implementing. I am happy to provide such a summary in this memo.

As you may recall, Bill Owens of the Kettering Foundation first approached Abu Arume about the drought situation in January of this year. At that time, several of our staff were engaged in a discussion with other scientists around the world about the extent and causes of the drought. Since there was a disagreement over facts, Owens apparently recognized that any international relief program would involve some conflict and considerable negotiation. He therefore proposed the series of face-to-face meetings which have now become known as the Camelian Relief Conference.

Before the meetings, Owens met with each of us individually. He explained to me that the meetings could take several weeks and wanted to be sure that I would be able to devote the time without a lot of pressures. He also spent considerable time on my personal background and goals for this conference. In the course of the conference, I realized that these questions were part of a deliberate--and very successful--strategy to build alliances among all of the participants. For example, at our very first coffee break, Owens introduced me to Jack Morris of Consolidated Produce, stressing my education at Berkeley. Afterwards, Jack and I had several friendly dinner debates. These were really helpful in sorting out our different perspectives. I realized that Morris would be judged at Consolidated by how well he was able to coordinate a relief program. So

naturally he was interested in feeding the most people at the lowest cost to Consolidated. And he was understandably impatient with our caution and concern about secondary implications of his "efficiency." It took me some time to make him understand that Arume and N'dolo both have strong tribal loyalties and that they would want to be sure that Consolidated's involvement in Camelia wouldn't jeopardize the present tribal coalition. Once we understood each other, we were able to move past political rhetoric in the conference.

The meetings began on February 16 in Lagos. Owens felt it was important to get all the participants out of their usual cultures--to get Clemmons out of his air-conditioned office and Arume away from the tensions of Timbalwe. Lagos qualified well in this respect. It was actually quite ironic (and funny) that it rained so hard several times during the conference. From the very first meeting, we joked about weather modification and saving some of the rain to take back to Camelia with us. I think all those jokes and the soggy handshakes made us feel like a group with a common adversary--the weather. And this attitude carried over into our formal meetings.

The formal meetings were always intense. There were different world views here, which made it hard to know when someone could compromise. But being together face to face helped. We weren't just exchanging "data." We were exchanging feelings--smiles and handshakes, dissatisfied frowns, and private glances with one participant or another. All of these helped us to see each other as individuals rather than ideologies. Jack Morris looks like cool efficiency personified on a television screen; but in person he is quite approachable and even quietly cynical about Clemmons' sermons on economic efficiency. That's not to say that everything was sweetness and roses. There were some loud confrontations between Clemmons and Arume and between Allan Draper and Helene Dubarieux of the LCF. Even Arume and I occasionally differed in our responses to Consolidated's proposals. (His point of view generally prevailed in these cases.) But we always had our less formal, social relationships to dissipate some of the hostility.

The problem that had brought us together--the discrepancies in the various data about the drought--was first discussed even before face-to-face meetings. Owens had arranged a computer conference with representatives

from the African Agricultural Board, the U.S. Food and Climate Institute, and the Camelian government. Three of the participants in this conference--Ribera, Pierson, and N'dolo--attended the face-to-face meetings. But the computer conference allowed them to involve their colleagues at home, while interpreting the data based on our discussions of cultural and political problems. This input was crucial in modeling the impacts of alternative relief strategies, for without a channel for discussing the underlying assumptions, they would have had a barrage of numbers with no way to interpret the discrepancies between the U.S. model and the AAB model.

I think that the key to the success of the conference was a discussion which took place late in the second week of the conference. We had been following our prepared agenda fairly closely up until then; it had been demanding, but we had managed to make several minor decisions about what to monitor. At this particular session, we were going to begin a discussion of the agricultural technologies which might be applied to the problem. Clemmons began the discussion with a glowing report of Consolidated's production records in several countries. Not surprisingly, Helene responded with some of her own reports about living conditions in those countries. As the debate grew, Clemmons became increasingly defensive about the social obligations of Consolidated while some of us grew increasingly hostile to his "economic efficiency." In the midst of all this, Arume jumped up from his seat and began to tell an old fable--which I'm sure most of you know--about the magical mango. He walked about the room as he told his own richly embellished version of the story and, as luck would have it, the side table was set with a bowl of fruit for our afternoon break. He began passing the fruit around as he talked, relating each piece to his story. By the time he was through, we were all munching fruit and laughing at the old farmer in the story, and the anger was gone. In its place was the recognition that we had hit upon one of the major differences in our world views. We all agreed to depart from our original agenda to explore this cultural difference in more detail.

Of course, incidents such as that didn't find their way into the mass media. We all agreed that, in the best interest of the negotiations, we should provide a single daily statement to the press. Bishop Ampleby usually drafted this statement. In fact, he proved to be a major mediating

force in the conference. It seems that Clemmons is a Methodist, too, and while he didn't share Ampleby's views about Third World development, he did seem to have an inherent trust in the man. On several occasions, I know that he consulted with Ampleby during lunch or coffee breaks and then modified his stand.

Of course, a lot of things contributed to the success of the meetings which will never appear in a formal report--things like sharing umbrellas, admiring someone's coat or pen or briefcase. Things like the wall charts prepared by Kettering staff for all of our presentations--I think they gave us a sense of equality about our information, and I know they saved us all the embarrassment of watching Ribera fumble through his notebook looking for his own small charts. (He's very near-sighted.) Helene Dubarieux's warm, but analytical approach to the meetings was constructive, too. The important thing to the world is that we have arrived at a common plan for Camelian relief. But I can assure you that it was due, in large measure, to some careful planning by Kettering and to the insight of Bill Owens who created the tone of the conference.

FACE-TO-FACE CONFERENCING

INEFFECTIVE USE

[Speech from George Clemmons to the Board of Directors, Consolidated Produce, Inc., drafted enroute from Paris to Nebraska]

Before we begin discussing possible responses to this grave situation, it is important for each of you to understand as accurately as possible the events which preceded the kidnapping of Kettering Foundation official Bill Owens and our Paris representative, Jack Morris by the Camelian terrorists who are now demanding that we set up a special food relief program.

Let me begin, ladies and gentlemen, by expressing my extreme sense of frustration following the Paris meeting which ended so tragically. Such tragedy, however, is in strong contrast to the spirit of hopefulness with which the meetings began. In fact, I can now see that we--and I mean all the participants--invested too much faith in that single four-day meeting, only to have it explode in our faces. It didn't, of course, explode immediately. We began by smoldering through two days of ~~*political rhetoric from*~~ *verbal sparring by all sides (yes, I'm afraid Consolidated must share a bit of this guilt as well).*

Bill Owens of Kettering Foundation had organized the meetings in a sincere attempt to develop some accurate assessments of the supposed drought in Camelia and--if there really is a drought--the precautions which ought to be taken. Owens identified 10 of us as participants in the meetings, based on his perception of the key organizations involved. He visited each of us to discuss the problem and then called the Paris meeting.

The decision to hold a face-to-face meeting was probably not as bad as the decision to hold only a single face-to-face meeting, with sessions scheduled so tightly that there was little opportunity for informal interaction. Sure, Owens distributed "position papers" before the meeting, but these only underscored our initial differences. Anyway, I wasn't at all sure that all the participants even read the position papers! I read them all, but didn't find them very enlightening. I also had my staff do biographies on each of the participants since I hadn't met any of them (except Jack and Bill Owens) and had only the most basic of information about them.

So, Owens was our only common contact before the Paris meeting, and he certainly did a lot to make me hopeful about the meetings. I remember calling him several times about issues which concerned me; each time, he gave me a "wait until Paris, George" answer. It was obvious that he was banking on one very good meeting, and he encouraged us to do the same.

The Paris meeting was to have lasted only four days--an attempt to fit it into all of our personal schedules. The agenda was very imposing, including both highly technical and interpersonal topics. Actually, the technical topics were enough to bog us down by themselves, since the African expert Ribera was arguing on the side of Camelia with weather and crop data that didn't agree either with Kettering information or with our own! All of the experts were away from their sources of information, and the rest of us were oppressed with the burden of dealing with all these issues in a single meeting. It was all downhill from there.

We struggled to get at the facts. But we didn't seem to be able to focus on the important facts. Abu Arume was completely preoccupied with local issues like Camelian "national integrity" and a bunch of tribal

problems, while Draper kept asking about the number of ships that could be mobilized for food transport. I think only a few of us recognized the real economic implications of the crisis, and we couldn't agree on how to measure them. Eventually, there was so much information being tossed about that it became impossible for all the participants to absorb everything at anywhere close to the same rate. And the technical discussion was supposed to have formed the foundation for our negotiations! It was like building a cloud on a swamp, and pretending we had a firm program.

In addition to all of our problems with contradictory information, there was very little time and no structure for small subgroup meetings. Our proceedings remained very formal and grew increasingly tiring as the hours wore on. We met all day and into the night, racing to finish our appointed tasks in the appointed time. As it became clear that we would not finish, a seed of hopelessness was planted in the group and obviously spread to the world outside the hotel.

Add: Arume used the press to berate the meeting arrangements, calling the hotel, and conference, all "Western decadence"

Such a spread of despair is not surprising since we were quite visible as a group. The press demanded interviews from each of us, and some of the participants appeared to use these interviews deliberately to place pressures on Consolidated and the State Department. ~~That woman~~ Helene Dubarieux was quoted in LE MONDE as saying: "The lives of one or two million people are at stake, and it appears that the conference may have been carefully manipulated by the corporate giants. It raises questions about the sincerity of the other participants and the seriousness of the meetings themselves." She carefully avoided me the next day, but it was obvious what she was trying to do.

I took Bill Owens aside and told him that such press reports, coupled with the confusion about actual data on the so-called drought, were

threatening to destroy the conference. Just as we were talking, Arume--the Camelian leader--came up and began debating the agricultural management issue. (Actually, Arume had an apparently insatiable desire to be at the center of things!) Owens never responded to my concerns, and Arume continued to burden the proceedings with his dogmatism.

In the final analysis, the conference probably would have benefited from less speech-giving and more listening. Arume was the worst offender, of course; I never figured out why he bothered to bring the other two Camelians with him. He completely dominated Francoise Mwanga, who might have contributed an economic perspective to the Camelian position. In fact, he never gave her a chance to speak. Dubarieux, too, tried to dominate the conference with emotional speeches ~~was hysterical much of the time~~, and our own State Department representative, Allan Draper, was actually fairly parochial in his view of U.S. involvement--when he wasn't asking about ships, he was talking about the obligations of Project Progress! Ribera, the ~~supposed~~ expert from the African Agricultural Board, fumbled through his presentations, and Professor Pierson, supposedly a key source of objective information, hardly got to say a word. Even Bishop Ampleby was a disappointment. I was hoping he could help us understand the Camelian objectives, but I never really got much chance to talk with him. In short, if the meetings had not been so tragic, they could easily be called a comedy of errors.

This description of the Paris meetings should give you some feeling for the frustration which preceded the kidnapping of Morris and Owens. In fact, as I am intimately aware, I could easily have been the one who was kidnapped. When I left Paris, the front page of every newspaper had a photograph of the large, silent crowd that attended the burial ceremonies

for the two French policemen killed Friday in the exchange of gunfire with the terrorists. We now have to make some decisions, and we must make them quickly . . . .

FACE-TO-FACE CONFERENCING
ANALYSIS

Perhaps the most fundamental characteristic of face-to-face communication is also its most obvious: participants share the same location simultaneously. This commonality of experience provides the basis for both planned and unplanned communication opportunities, like rain. . . .

> We joked about weather modification and saving some rain to take back to Camelia with us. I think all those jokes and soggy handshakes made us feel like a group with a common adversary--the weather. And this attitude carried over into our formal meetings.

Such shared experiences may seem trivial, but they will have an impact on a face-to-face conference. The *kind* of impact--beneficial or destructive--will depend a lot on the choices of the conference organizer.

"FRIENDLY" . . . BUT LOTS OF TIME PRESSURES

Experience to date suggests that face-to-face communication is perceived as more "friendly" than any of the teleconferencing media (F11-F13).[13] In fact, most people respond more positively to face-to-face meetings (F16, F17, F21) and are more confident in their communication when they meet in person (F19, F20). A major reason for these perceptions is probably the opportunity for informal and unplanned meetings. These meetings are likely to be more personal; they are likely to build a sense of intimacy among the participants. And as in the Effective Scenario, they are likely to shape the more formal communication:

> It seems that Clemmons is a Methodist, too, and while he didn't share Ampleby's views about Third World development, he did seem to have an inherent trust in the man. On several occasions, I know that he consulted with Ampleby during lunch or coffee breaks and then modified his stand.

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[13] The codes in this analysis refer to the numbers of the "strengths" and "weaknesses" listed for each of the media in the Summary of Social Evaluations of Teleconferencing in the Reference Materials. Thus: V for video, C for computer conferencing, etc.

Owens made a real effort to encourage such alliances. Again from Mwanga's view:

> He also spent considerable time on my personal background and goals for this conference. In the course of the conference, I realized that these questions were part of a deliberate--and very successful--strategy to build alliances among all of the participants.

Of course, the initial openness to face-to-face communication can be short-lived if it is not cultivated. In the Ineffective Scenario, Bill Owens failed to bring the group members together. He did distribute position papers, but as Clemmons noted, "These only underscored our initial differences." And we suspect that the original optimism made the failures even worse. Thus, Clemmons admitted that they had "invested too much faith in that single four-day meeting, only to have it explode in our faces." Finally, the same intensity of communication which creates intimacy can be perceived as pressure; and in a short meeting with too many tasks, we suggest that this pressure can destroy the communication.

In the Ineffective Scenario, for example, there was an overemphasis on a single meeting to accomplish *all* of the group's goals. Clemmons said it well when he said, "The decision to hold a face-to-face meeting was probably not as bad as the decision to hold *only* a single face-to-face meeting." The result was a highly structured and intense meeting which allowed few opportunities for the informal contacts that are a basic strength of face-to-face communication. On the other hand, in the Effective Scenario, Owens relied on a *series* of face-to-face meetings. The increased time, together with a less structured conference format, played a crucial role in allowing the participants to explore the cross-cultural differences revealed by Arume's tale about the farmer and the magical mango. Such a "digression" would have been impossible in a more rigid, harried meeting.

SAVE THE COMPLEX TASKS FOR FACE-TO-FACE

Comparisons of face-to-face with audio and video have concluded that face-to-face is superior for more complex tasks, particularly those involving conflict and negotiation (F1-F4, F18). At the same time, other evidence

suggests that more messages are exchanged via face-to-face, and more options are discussed (F8-F10). We guess that time is again a critical variable here: in the short, formal meeting of the Ineffective Scenario, the participants managed to raise all of the complexities of the Camelian problem but were unable to move beyond "verbal sparring." Another problem was the overemphasis on information. If teleconferencing media are better than face-to-face for information exchange, we suspect that discrepancies in data will be troublesome in Owens' four-day Paris meeting, particularly since participants have varied levels of expertise. Thus, Clemmons reported, "There was so much information that it became impossible for all the participants to absorb everything at anywhere close to the same rate." Owens' response to this problem in the Effective Scenario is the preconference computer conference.

A major question in this division of labor among conferencing media is raised by the negotiation experiments which imply that visual communication can actually serve as a distraction from substantive concerns (F23-F25; also A17-A21). Such findings are intriguing but don't seem convincing enough to change the focus of the scenarios. They currently represent the dominant view in social evaluations of teleconferencing: complex tasks should be reserved for face-to-face communication.

A MEDIUM FOR GREAT ORATORS

If social presence is important to group communication, face-to-face is clearly the richest of the communications media considered here. However, richness does not guarantee everyone an equal hearing. In fact, the current evaluations suggest that all three teleconferencing media promote greater equality of participation than face-to-face (A35, C23, C24, V30, V31). Some people, like Arume, will dominate this medium. Arume is a natural orator; he can take command of a meeting and have a profound effect on its outcome:

> In the midst of all this, Arume jumped up from his seat and began to tell an old fable--which I'm sure most of you know--about the magical mango. . . . By the time he was through, we were all munching fruit and laughing at the old farmer in the story, and the anger was gone.

While productive in this example, too many orators out of control can be disastrous, as Clemmons noted in the Ineffective Scenario. There, Arume was the worst offender; he never gave the other Camelians a chance to speak. Dubarieux, too, was accused of dominating the medium, while Pierson, a "key source of objective information, hardly got to say a word." A group leader may thus have to consider individual traits more carefully for face-to-face meetings, balancing them with the needs of the group.

IN SUMMARY . . .

The communications richness of face-to-face is unequalled by teleconferencing media. The important question for a conference organizer is: When can this richness be used most effectively and when is it unnecessary or even misleading? A face-to-face meeting seems a wise preface for any teleconference. In addition, it would also seem prudent to relegate complex communication tasks to face-to-face, although teleconferencing media might be used in a supporting role. However, while face-to-face will remain the most "natural" medium to most people for some time to come, it is not necessarily the most efficient for all situations--nor even the most "human."

REFERENCE MATERIALS

A SUMMARY OF SOCIAL EVALUATIONS OF TELECONFERENCING

A review of the literature on social evaluation requires detective skills in addition to conventional library research. The studies are scattered, and many have not been formally published. Some were done as proprietary reports and never distributed broadly. Accordingly, we felt a need for a comprehensive summary of evaluation results; we hope that this summary will spare others the frustrations of reviewing this important--but sometimes inaccessible--body of literature.

The findings from the literature are paraphrased in "strengths" and "weaknesses" which are grouped under a series of summary statements.[14] A classification of studies then provides basic information about the characteristics of each study in chart form. We have attempted to build a bridge between the summary of strengths and weaknesses and the analyses of the scenarios by using codes. For example, in the analysis of the computer teleconferencing scenario, readers will find a code "C25." This code refers to the 25th finding under computer teleconferencing, that "participants can learn to use computer conferencing quickly." Four studies are cited for this finding: Turoff, 1972b and 1975b; Vallee et al., 1975; and Irving, 1976. If readers wish to know more about these studies, they may consult the chart at the end of this section for information about the type of study, the medium used, the number and type of participants, the length of media usage, and the conferencing arrangements and tasks. Full references appear in the bibliography.

We have made no attempt to critique the findings presented here; we have merely summarized them. Also, the studies cited are limited to social evaluations of audio, video, or computer-based teleconferencing. Studies

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[14] We owe a special debt to James Craig of the Communications Research Centre in Ottawa, Canada, who first suggested a pros and cons reporting format in an unpublished paper summarizing results from evaluations of audio teleconferencing.

from related fields are cited only when the results bear directly on teleconferencing (i.e., small group communication through an electronic medium). Studies of face-to-face communication are cited only where comparisons with mediated communication were involved.

We have undoubtedly missed some sources of information. We hope that readers of this report will send us any additions which they think should be included, since we may periodically update this literature review.

EVALUATIONS OF VIDEO TELECONFERENCING

STRENGTHS

Video meetings are satisfactory for a wide range of typical business communication tasks, but are particularly valuable--compared to nonvisual media--for complex communication situations.

1. Picturephone® is perceived as more effective than telephone and less effective than face-to-face for all common business situations.	*Wish, 1975*
2. Video is perceived as satisfactory for giving or receiving information, asking questions, exchanging opinions, solving problems, and generating ideas.	*Champness, 1973* *Williams and Holloway, 1974* *Jull and Mendenhall, 1976*
3. The exchange of information is as effective via video as via face-to-face.	*Champness and Reid, 1970* *Davies, 1971a,b* *Williams and Holloway, 1974*
4. Video is perceived as more satisfactory than face-to-face for handling regularly scheduled communications and for giving or receiving information.	*Noll, 1976*
5. Video is more useful than audio for complex group discussions, private conversations, and nonprivate dyadic conversations.	*Christie, 1974a*
6. The more complicated the task, the more the visual channel is likely to make a contribution (and be perceived as necessary).	*Westrum, 1972, in Connors, Lindsey, and Miller, 1976*
7. The Bell Laboratories' video system has been used for talking to several people at once, communicating with people of the same rank, and communicating within the company.	*Noll, 1976*
8. Video is perceived to be satisfactory for committee-like coordination and information exchange.	*Noll, 1976*

Video is more effective than nonvisual media for tasks which stress interpersonal communication.

9. Video is perceived as better than audio for interpersonal relations.*	*Champness, 1972a*
10. Video is perceived as more effective than audio for forming an impression of others.	*La Plante, 1971, in Short, Williams, and Christie, 1976* *Williams, 1972a,b; 1974c* *Not shown in Young, 1974*
11. Video provides a greater feeling of social contact than audio.	*Communications Studies Group, 1975* *Short, Williams, and Christie, 1976*
12. Video is perceived as better than audio if participants do not know each other.	*Christie, 1974b*
13. Video is better than audio when reactions must be carefully noted.	*Hammond and Elton, 1975*
14. Video is more effective than audio for maintaining friendly relations (tentative conclusion).	*Williams, 1974c*
15. Eye contact is an important part of communication for feedback, synchronization of speech, and affiliative balance.	*Argyle, Lalljee, and Cook, 1968*
16. There is less group uncertainty when participants can be seen.	*Westrum, 1972*
17. The sense of presence of the other people via video may be more important than the specific visual information which is communicated.	*Communications Studies Group, 1975* *Short, Williams, and Christie, 1976*
18. Seeing the other person is of real, but limited, value for conversational tasks.	*Klemmer, 1973*

The visual capabilities inherent in video systems are important advantages for some types of group communication.

19. Video is better than audio when language barriers exist.	*Hammond and Elton, 1975*

*Indicates existence of contrary findings.

20. For both Italian and English subjects, higher accuracy scores for communicating information about two-dimensional shapes were obtained when gestures were allowed.	*Graham, Ricci Bitti, and Argyle, 1975*
21. For both English and Italian subjects, emotional messages can be conveyed through facial expressions alone as effectively as by gestures and other bodily clues combined.	*Graham, Ricci Bitti, and Argyle, 1975*
22. A person's detection, information processing, and retention are greater when both the audio and video senses are used.	*Mowbray and Gebhard, 1961*
23. Video communication seems essential for situations involving remote supervision of an anesthetic, speech therapy, and psychiatric diagnosis.	*Mark, 1975*
24. Video teleconferencing can be used to manage successfully more than 90 percent of the medical problems typically encountered in a general ambulatory clinic.	*Murphy and Bird, 1974*
25. Teleconferencing can serve as a medium for collegial interaction among distantly located health professionals.	*Bashshur, 1975*
26. When telediagnosis is used, the physician's time with patients can be maximized.	*Park, 1975*
27. Telemedicine is an integrative mechanism which counters the proliferation of medical specialization.	*Bashshur, 1975*

Video meetings are orderly, but not necessarily hierarchical.

28. Time spent for maintaining group organization is lower for video than for audio (but video is greater than face-to-face).	*Weston, Kristen, and O'Connor, 1975*
29. Meetings seem to be conducted more quickly via video than via face-to-face.	*Williams and Holloway, 1974*

30. Video meetings are perceived to be more orderly than face-to-face meetings.	*Champness, 1973* *Williams and Holloway, 1974* *Ellis, McKay, and Robinson, 1976*
31. Internal group structure and hierarchy do not emerge as clearly in video as in face-to-face.	*Strickland, Guild, Barefoot, and Patterson, 1975*
32. Video has an implicit "unorganized formality"; people are more polite and solicit participation from quiet members in a way that doesn't happen in face-to-face. Leaders do not emerge spontaneously and indeed seem not to be needed.*	*George, Coll, Strickland, Paterson, Guild, and McEown, 1975*

New users tend to respond positively to video.

33. Video is more aesthetic than audio.	*Champness, 1972b*
34. People tend to react more positively to video (and face-to-face as well) than to audio.	*Weston and Kristen, 1973* *Ryan and Craig, 1975*
35. New users typically have positive feelings toward the use of video teleconferencing.	*Duncanson and Williams, 1973* *Williams and Holloway, 1974* *British Columbia Telephone, 1974* *Champness, 1973* *Ellis, McKay, and Robinson, 1976*
36. People are generally more confident in their perceptions of others via video than via audio, but not necessarily more accurate.	*Reid, 1970*
37. Video is perceived to be faster and more convenient than the telephone, but this perception is not supported by objective measures.	*Woodside, Cavers, and Buck, 1971*
38. Doctors appear to be more confident in their diagnoses of patients by video or face-to-face than audio.	*Moore, Willemain, Bonanno, Clark, Martin, and Mogielnicki, 1975* *Not supported in Conrath, Dunn, Bloor, and Tranquada, 1976*

*Indicates existence of contrary findings.

39. In a survey of Bell Laboratories' personnel, only 3 percent of travelers would be willing to substitute a system which did not provide moving picture video. *Snyder, 1973*

Video meetings may be more "persuasive" than meetings via other media.

40. More opinion change occurs via video than via face-to-face (but less than or the same as via audio). *Short, 1972a,b; 1973a,b*

EVALUATIONS OF VIDEO TELECONFERENCING

WEAKNESSES

Video meetings are not perceived as satisfactory for communicating with strangers or people of different ranks; furthermore, they may not be necessary for many tasks for which they are satisfactory.

41. Bell Laboratories' video system is not used for communicating with strangers, talking to only one or two people, or communicating with subordinates or superiors.	*Noll, 1976*
42. High-status persons use the Picturephone® to call subordinates, but subordinates are much more likely to use the telephone when communicating with someone of a higher rank.	*Imberger, 1975, in Christie and Elton, 1975*
43. Participants are more likely to prefer a face-to-face meeting (rather than video) if they have not known each other previously.	*Christie and Holloway, 1975* *Jull and Mendenhall, 1976*
44. Video is perceived as questionable for getting to know someone, bargaining, and persuasion.	*Champness, 1973* *Short, 1973* *Williams and Holloway, 1974* *Jull and Mendenhall, 1976*
45. Video systems are only marginally superior to audio systems which include telegraphics.	*Casey-Stahmer and Havron, 1973*
46. Managers are no more likely to choose to telecommunicate rather than travel when video is an option than when audio is an option.	*Christie and Kingan, 1976*
47. The addition of a visual channel to audio does not appreciably decrease times to solution of simple problems.	*Weeks and Chapanis, 1976*
48. Less than 20 percent of existing business meetings need to be conducted by video.	*Christie and Elton, 1975*

While better than audio for some interpersonal tasks, video meetings may not match the quality of face-to-face meetings.

49. Video is sometimes perceived as lacking a sense of personal contact with other participants.	*Champness, 1973* *Williams, 1973* *Short, Williams, and Christie, 1976*
50. The feeling of "presence" is low for normal TV screens. A projection display increases feeling of "presence," but is difficult to use and maintain at the present time.	*Midorikawa, Yamagishi, Yada, and Miwa, 1975*
51. Some very important aspects of social interaction are visual.*	*Argyle, 1969*
52. In a seminar taught by video, students at locations remote from the professor felt inhibited, had more negative attitudes toward the course, and earned lower grades than those in the same room with him.	*Larimer and Sinclair, 1969*
53. While remote patient diagnosis was accurate in primary diagnosis, it was not as effective as face-to-face in detecting secondary illnesses.	*Conrath, Dunn, Swanson, and Buckingham, 1975* *Wempner, 1975* *Not supported in Conrath, Dunn, Bloor, and Tranquada, 1976*

Some of the characteristics of video may be perceived as disadvantages by the users.

54. Video systems are less "private" than audio or face-to-face.	*Champness, 1972a,b* *Ryan, 1975* *British Columbia Telephone, 1974*
55. Personal communication style (e.g., referring to personal notes while talking) is sometimes more limited by video.	*Short, Williams, and Christie, 1976*
56. Features of video (e.g., color necessary for map display, as well as wide-angle shots) may be difficult to match to the specific needs of a group.	*Christie, 1974b*

*Indicates existence of contrary findings.

57. Video is susceptible to a "Hollywood syndrome" where participants--often unconsciously--use film or television as models for how they are to behave.	*Bretz, 1974*
58. In group-to-group teleconferencing, "we"-to-"they" tendencies can develop, influencing within-terminal and between-terminal communication patterns.	*Casey-Stahmer and Havron, 1973* *Weston, Kristen, and O'Connor, 1975* *Williams, 1975a* *British Columbia Telephone, 1974*
59. Even a small distance to a video studio can be a disincentive to participation in a video conference.	*Jull and Mendenhall, 1976* *Not supported in Christie and Kingan, 1976*

EVALUATIONS OF COMPUTER TELECONFERENCING

STRENGTHS

The print mode provides some advantages over the spoken word of other media.

1. The written record basic to the computer conferencing medium is crucial for some tasks.	*Sinaiko, 1963* *Vallee, Johansen, Lipinski, Spangler, and Wilson, 1975* *Ferguson and Johansen, 1975* *Vallee and Wilson, 1976* *Vallee, Johansen, Lipinski, MacMillan, and Wilson (forthcoming)* *Spelt, 1977*
2. Handwritten messages are more persuasive than video or face-to-face communications.*	*Wall and Boyd, 1971*
3. Computer conferencing allows time for reflection on the topic of conversation.	*Turoff, 1974a* *Vallee, Johansen, Lipinski, MacMillan, and Wilson (forthcoming)* *Ferguson and Johansen, 1975* *Zinn, Parnes, and Hench, 1976* *Spelt, 1977*
4. Typewritten communications are much less verbose than voice channels for solving the same simple problems.	*Weeks and Chapanis, 1976*
5. Computer conferencing is well suited for communication involving the deaf, the handicapped, and homebound persons.	*Turoff, 1975b*

Computer conferencing increases continuity of communication by making it less dependent on time and space.

6. Access to computer conferencing can make working hours more flexible.	*Turoff, 1974a* *Vallee, Johansen, Lipinski, Spangler, and Wilson, 1975* *Ferguson and Johansen, 1975* *Hiltz, 1976b* *Irving, 1976* *Vallee, Johansen, Lipinski, MacMillan, and Wilson (forthcoming)*

*Indicates existence of contrary findings.

7. Computer conferencing can be used well as a preface and/or follow-up to a face-to-face conference.	*Vallee and Wilson, 1976*
8. Computer conferencing can provide a continuous link among disseminated researchers.	*Vallee, Johansen, Lipinski, Spangler, and Wilson, 1975* *Zinn, 1977* *Vallee, Johansen, Lipinski, MacMillan, and Wilson (forthcoming)*
9. Computer conferencing can promote communication among disseminated groups who may not otherwise communicate *if* the need to communicate is high enough.	*Ferguson and Johansen, 1975* *Hiltz, 1976b* *Irving, 1976* *Spelt, 1977*
10. With computer conferencing, as many as 50 people can work together on a project.	*Turoff, 1975* *Irving, 1976*

It is possible to get a sense of interpersonal interaction with computer conferencing.

11. Computer conferencing can support self-presentation and emotional subtleties.	*Vallee and Johansen, 1974*
12. There can be a strong sense of personal interaction.*	*Spelt, 1977* *Vallee, Johansen, Lipinski, MacMillan, and Wilson (forthcoming)*
13. Synchronous sessions are seen as more personal than asynchronous sessions and are desired by users.	*Vallee, Johansen, Lipinski, Spangler, and Wilson, 1975* *Ferguson and Johansen, 1975*

Computer conferencing is particularly well suited to tasks involving the management of technical information.

14. Computer conferencing introduces human judgment at a new level in an information system.	*Vallee and Askevold, 1975*

*Indicates existence of contrary findings.

15. Users have reported an ability to deal with larger amounts of information more efficiently (though beyond a certain point, information overload can occur).	*Vallee and Askevold, 1975* *Bennett, 1975*
16. Computer conferencing appears particularly useful in coordinating technical projects.	*Vallee and Askevold, 1975* *Vallee and Wilson, 1976*
17. Participants can obtain more deliberate answers to technical questions, backed up by written facts and with less delay.	*Vallee and Askevold, 1975*
18. Computer conferencing can be used to enhance crisis resolution.	*Kupperman, Wilcox, and Smith, 1975*
19. Computer conferencing can be used to aggregate group judgment.	*Turoff, 1972b; 1974a* *Lipinski, Lipinski, and Randolph, 1972* *Jillson, 1975*
20. Computer conferencing is perceived as satisfactory for exchanging information, asking questions, exchanging opinions or orders, staying in touch, and generating ideas.	*Vallee, Johansen, Lipinski, MacMillan, and Wilson (forthcoming)*

Computer conferencing promotes equality and flexibility of roles in the communication situation.

21. Participants vary their roles from conference to conference.	*Vallee and Johansen, 1974* *Vallee, Johansen, Lipinski, Spangler, and Wilson, 1975*
22. Computer conferencing can enhance candor of opinions.	*Turoff, 1972a; 1975b* *Day, 1975* *Vallee and Askevold, 1975* *Irving, 1976*
23. The amount of communication per participant is more nearly equal in the real-time typewritten mode than in audio or face-to-face. (This equality can sometimes be a negative factor.)	*Krueger, 1976, in Williams, 1976b*
24. Greater equality in group participation can be facilitated by the use of computer conferencing, especially in synchronous sessions.	*Vallee, Johansen, Lipinski, Spangler, and Wilson, 1975* *Ferguson and Johansen, 1975*

Computer conferencing can be used by people without highly specialized skills.

25. Participants can learn to use computer conferencing quickly.	*Turoff, 1972b; 1975b* *Vallee, Johansen, Lipinski, Spangler, and Wilson, 1975* *Irving, 1976*
26. Computer expertise is not a prerequisite to effective use of computer conferencing.	*Vallee, Johansen, Lipinski, Spangler, and Wilson, 1975*
27. Lack of typing ability is not a barrier to participation in computer conferencing.	*Vallee, Johansen, Lipinski, Spangler, and Wilson, 1975*

EVALUATIONS OF COMPUTER TELECONFERENCING

WEAKNESSES

The written communications inherent in computer conferencing are less efficient than other media.

28. Both audio and face-to-face allow many more messages to be exchanged in a given time period than does typing.	*Sinaiko, 1963* *Chapanis, Ochsman, Parrish, and Weeks, 1972; Chapanis, 1973* *Chapanis and Overby, 1974* *Ochsman and Chapanis, 1974* *Weeks and Chapanis, 1976* *Krueger, 1976, in Williams, 1976b* *Not supported in Turoff, 1972b*
29. Written negotiations take more time, are more rigid, and are more susceptible to developing intransigent positions.	*Kite and Vitz, 1966*
30. It is sometimes difficult to focus the discussion in computer conferencing.	*Ferguson and Johansen, 1975*
31. Problems take longer to solve in written modes.	*Chapanis, Ochsman, Parrish, and Weeks, 1972* *Krueger, 1976, in Williams, 1976b* *Ochsman and Chapanis, 1974*
32. Participants are sometimes reluctant to make certain statements in writing.	*Kite and Vitz, 1966* *Vallee, Johansen, Lipinski, Spangler, and Wilson, 1975*
33. Computer conferencing is perceived as unsatisfactory for bargaining, resolving disagreements, persuasion,* and getting to know someone.	*Vallee, Johansen, Lipinski, MacMillan, and Wilson (forthcoming)*

*Indicates existence of contrary findings.

The self-activated nature of the medium may inhibit its use.

34. Regularity of individual participation is sometimes difficult to enforce in computer conferencing.	*Vallee, Johansen, Lipinski, Spangler, and Wilson, 1975* *Ferguson and Johansen, 1975* *Spelt, 1977*
35. A perceived need to communicate is necessary to encourage regular participation in computer conferencing.	*Vallee and Johansen, 1974* *Vallee, Johansen, Lipinski, Spangler, and Wilson, 1975*
36. In written or typewritten communication, the amount of time spent in noncommunicative activities is much greater than in the oral mode.	*Ochsman and Chapanis, 1974*
37. Managers have a strong preference for verbal and immediate (often unscheduled) communication.	*Mintzberg, 1971*

The communication process in computer conferencing is very demanding.

38. Training of new users is very important.	*Vallee, Johansen, Lipinski, Spangler, and Wilson, 1975* *Irving, 1976*
39. Participants must learn new skills to use computer conferencing (e.g., how to send a message).	*Vallee, Johansen, Lipinski, Spangler, and Wilson, 1975*
40. Computer conferencing is vulnerable to poor human/machine interface with both computer networks and computer terminals.	*Vallee, Johansen, Lipinski, Spangler, and Wilson, 1975*
41. Computer conferencing could easily be used to confuse other participants.	*Vallee, Lipinski, Johansen, and Wilson, 1975*
42. The volume of information in a computer conference can sometimes become overwhelming.	*Ferguson and Johansen, 1975* *Vallee, Johansen, Lipinski, MacMillan, and Wilson (forthcoming)*
43. In synchronous computer conferencing, messages are not sequential and multiple topic threads can appear; information overload can thus result.	*Vallee and Wilson, 1976* *Vallee, 1976*
44. Computer conferencing demands strong leadership.	*Johansen, Vallee, and Palmer, 1976*

The sense of interpersonal interaction is sometimes weak in computer conferencing.

45. There is often a lack of interpersonal feedback; those who perceive the need for immediate feedback might thus be frustrated.	*Ferguson and Johansen, 1975* *Kettering Foundation (forthcoming)*
46. Participants sometimes feel a lack of group interaction.	*Ferguson and Johansen, 1975* *Kettering Foundation (forthcoming)*
47. Questions asked within computer conferences often go unanswered.	*Hiltz, 1976b* *Kettering Foundation (forthcoming)*
48. The use of surrogates in a computer conference can inhibit levels of trust and security.	*Kettering Foundation (forthcoming)*
49. French Canadians react more negatively to computers and their potential than do English Canadians.	*Ryan and Cummings, 1973*

EVALUATIONS OF AUDIO TELECONFERENCING

STRENGTHS

Audio meetings are adequate for a number of typical business and research situations; they are particularly satisfactory for communications tasks which stress information exchange and problem-solving.

1. The telephone is not in any simple sense inferior to face-to-face contact.	*Reid, 1976*
2. Audio is perceived as only slightly less satisfactory than face-to-face meetings.	*Craig and Jull, 1974* *Weston and Kristen, 1973*
3. Managers are no more likely to choose to telecommunicate rather than travel when video is an option than when audio is an option.	*Christie and Kingan, 1976*
4. About 40 percent of existing business meetings *could be* conducted by audio or audio-plus-graphics.	*Christie and Elton, 1975 (3 CSG surveys)*
5. Simple problem-solving can be effectively conducted via audio.	*Davies, 1971a,b* *Champness, 1971; 1972a,b* *Short, 1971a,b; 1972a,b* *Woodside, Cavers, and Buck, 1971* *Chapanis, Ochsman, Parrish, and Weeks, 1972* *Connors, Lindsey, and Miller, 1976* *Thomas and Williams, 1975* *Christie, 1975b*
6. Meetings which emphasize "information-seeking" and "discussion of ideas" can be effectively conducted via audio.	*Williams, 1974c* *Connors, Lindsey, and Miller, 1976* *Thomas and Williams, 1975*
7. Audio is satisfactory for giving orders, decision-making, settling a difference of opinion,* and holding briefings.	*Stapley, 1973*

*Indicates existence of contrary findings.

8. Audio is good for continuing contacts with those with whom one is already acquainted.	*Connors, Lindsey, and Miller, 1976*
9. There is no difference in output or quality of ideas in audio brainstorming sessions* compared to video and face-to-face.	*Williams, 1975a*
10. The visual channel is not necessary for gaining initial perceptions of others and in understanding how others perceive you.*	*Young, 1974b*
11. Audio meetings are generally perceived as at least as "rewarding," "friendly," and "enjoyable" as face-to-face committee meetings.	*Christie, 1975a*
12. Audio can be used as effectively as face-to-face or video for interviewing.	*Reid, 1970* *Janofsky, 1971* *Young, 1974a*
13. Audio is perceived to be effective for crisis decision-making when a face-to-face meeting would not be possible.	*Thomas and Williams, 1975* *Short, 1973c*
14. For conducting psychiatric interviews, the telephone can be used as effectively as face-to-face.	*Simon, Fleiss, Fisher, and Gurland, 1974*
15. Teleconferencing can serve as a medium for collegial interaction among distantly located health professionals.	*Bashshur, 1975*
16. Audio teleconferencing, used by sophisticated health professionals, is suitable for most neighborhood health clinics, chronic disease follow-up programs, etc.	*Mark, 1975*

In intense communication situations, such as bargaining or negotiation, audio meetings may offer subtle advantages to some participants.

17. In negotiation, the side with the strongest case is more successful in audio than in face-to-face.	*Morley and Stephenson, 1969; 1970* *Short, 1971a,b* *Weeks and Chapanis, 1976*

*Indicates existence of contrary findings.

18. In bargaining and negotiation via audio, effective communication is less dependent on interpersonal than on substantive considerations; a visual image can actually be distracting to the substantive proceedings.	*Sinaiko, 1963* *Morley and Stephenson, 1969; 1970* *Short, 1971a; 1974*
19. More opinion change occurs as one effect in conflict situations via audio than face-to-face (implying that audio is better for persuading or adopting another point of view).*	*Short, 1972a,b; 1973b* *Young, 1974b (but not statistically significant)*
20. Participants feel it is easier to get a point across without a lengthy debate in audio than in face-to-face.	*Christie, 1975a*
21. Individuals are perceived as more persuasive and trustworthy via audio than face-to-face or video.	*Short, 1972c*
22. Lying is easier to detect in audio than in face-to-face.	*Krauss, in Williams, 1976* *Maier and Thurber, 1968* *Reid, 1970 (found no significant difference between audio and face-to-face)*
23. Audio is perceived as more revealing than video or face-to-face during interviews.	*Young, 1974a*

Audio permits rapid communication, with less travel.

24. Audio meetings are shorter than face-to-face meetings.	*Craig and Jull, 1974* *Short, 1973* *Casey-Stahmer and Havron, 1973* *Christie, 1975a* *Mendenhall and Ryan, 1975* *Thomas and Williams, 1975*
25. Media which involve voice communication are much faster than writing or typing.	*Ochsman and Chapanis, 1974*
26. Audio tends to be faster than face-to-face for simple problem-solving experiments when unlimited time is available.	*Davies, 1971a* *Not supported in Chapanis, Ochsman, Parrish, and Weeks, 1972*

*Indicates existence of contrary findings.

27. Audio is most useful when meetings are *short* and *regular*.	*Short, Williams, and Christie, 1976*
28. Audio can be most useful when people are more than one-half hour apart.	*Williams, 1975c* *Short, Williams, and Christie, 1976*
29. Audio has been highly successful in reducing the total amount of traveling done by a bank's management staff.	*Christie, 1975a*

Audio permits accurate communication.

30. Accuracy in the transmission and reception of information is not affected by the absence of vision.	*Champness and Reid, 1970* *Davies, 1971a,b* *Reid, 1976* *Stapley, 1973* *Simon, Fleiss, Fisher, and Gurland, 1974*
31. Participants feel they are more attentive to what is being said in an audio system than face-to-face.	*Christie, 1975a*
32. Audio is at least as effective as face-to-face for assessing other persons.	*Giedt, 1955* *Maier and Thurber, 1968* *Reid, 1970*
33. The audio channel can provide all the basic information necessary for preliminary medical diagnosis.	*Conrath, Bloor, Dunn, and Tranquada, 1976*

Audio promotes controlled participation.

34. Meetings are more orderly ("business-like") in audio than in face-to-face.	*Short, 1973c* *Jull, McCaughern, Mendenhall, Storey, Tassie, and Zalatan, 1976*
35. Audio allows more control over individuals who dominate the conversation and thus more chance for everyone to participate.	*Holloway and Hammond, 1976*

EVALUATIONS OF AUDIO TELECONFERENCING

WEAKNESSES

Audio meetings are not satisfactory for tasks which stress interpersonal communication, such as negotiation or getting to know someone.

36. Audio is not satisfactory when emotions run high or nature of the task is "complex."	*Connors, Lindsey, and Miller, 1976*
37. Participants feel that audio is not satisfactory for such activities as resolving conflicts, persuading others,* resolving disagreements,* or negotiating.	*Short, 1973c* *Craig and Jull, 1974* *Thomas and Williams, 1975* *Connors, Lindsey, and Miller, 1976* *Christie, 1975a*
38. There is more breakdown in negotiation via audio than face-to-face.	*Dorris, Gentry, and Kelley, 1970, in Short, 1971a* *Short, 1971a* *Champness, 1971*
39. Audio meetings are not satisfactory for forming impressions of others.*	*Craig and Jull, 1974*
40. Audio is not perceived to be satisfactory for getting to know someone.*	*Stapley, 1973* *Craig and Jull, 1974* *Thomas and Williams, 1975* *Connors, Lindsey, and Miller, 1976*
41. Audio can be poorly received if participants have not known each other previously.	*Christie and Holloway, 1975* *Connors, Lindsey, and Miller, 1976* *Jull and Mendenhall, 1976*
42. For "getting to know someone," people who have met face-to-face or via video are judged more favorably than people who have met by telephone.	*Williams, 1972a; 1975b*

*Indicates existence of contrary findings.

Audio can create an impersonal, uncooperative communications environment.

43. Audio is perceived as less "personal" than face-to-face.	*Morley and Stephenson, 1969* *Williams, 1972a* *Short, 1973c* *Holloway and Hammond, 1976*
44. Nonverbal cues are important to indicate the psychological state of each participant (e.g., their reactions) in the progress of the interaction.	*Argyle, Lalljee, and Cook, 1969* *Duncan, 1969*
45. There is often skepticism concerning the content of a message in an audio-only conference, especially when the message is not followed by a written note.	*Mendenhall and Ryan, 1975*
46. In group-to-group teleconferencing, "we" to "they" tendencies can develop, influencing within-terminal and between-terminal communication patterns.	*Casey-Stahmer and Havron, 1973* *Weston, Kristen, and O'Connor, 1975* *Williams, 1975a*
47. Audio environment is considerably more "hostile" than either video or face-to-face.	*Weston, Kristen, and O'Connor, 1975*
48. In negotiation situations, such as the game called "Prisoners' Dilemma," cooperation is difficult to achieve using audio.	*Wichman, 1970* *La Plante, 1971, in Short, Williams, and Christie, 1976* *Not replicated by Heilbron, 1971, in Wilson, 1974*
49. In controlled experiments, individuals will administer more severe shocks to victims they cannot see.	*Milgram, 1965* *Not supported in Penner and Hawkins, 1971, in Short, Williams, and Christie, 1976*

Audio may be less productive than other media.

50. Audio groups spend less time on task-related discussion (about 10 percent less) than either video or face-to-face.*	*Weston, Kristen, and O'Connor, 1975*

*Indicates existence of contrary findings.

51. An unseen audience inhibits cognitive performance more than a visible audience.	*Wapner and Alper, 1952*
52. Fewer words were spoken in a given time period via audio than via either video or face-to-face.	*Weston, Kristen, and O'Connor, 1975* *Not supported in Chapanis, 1973*
53. In a conference held to generate recommendations, audio groups made far fewer and less complex recommendations.	*Weston, Kristen, and O'Connor, 1975*
54. Audio meetings are not satisfactory for generating ideas.*	*Craig and Jull, 1974*
55. While remote patient diagnosis was accurate in primary diagnosis, it was less effective than face-to-face in detecting secondary illnesses.	*Conrath, Dunn, Swanson, and Buckingham, 1975* *Not supported in Conrath, Dunn, Bloor, and Tranquada, 1976*
Audio meetings are personally demanding.	
56. Audio meetings require more chairman control than face-to-face.	*Short, 1973c*
57. Time spent for maintaining group organization was greater for audio than for face-to-face.	*Weston, Kristen, and O'Connor, 1975*
58. Audio meetings are more tiring than face-to-face meetings.	*Short, 1973c* *Jull, McCaughern, Mendenhall, Storey, Tassie, and Zalatan, 1976* *Not supported by Mendenhall and Ryan, 1975* *Christie, 1975a*
59. Varied accents are often difficult to understand over the telephone.	*Woodside, Cavers, and Buck, 1971*
Users typically have negative expectations about audio.	
60. People often react negatively to audio teleconferencing.	*Weston and Kristen, 1973* *Ryan and Craig, 1975* *Christie, 1975a*

*Indicates existence of contrary findings.

61. Audio promotes more initial skepticism on the part of users than does video or face-to-face.	*Mendenhall and Ryan, 1975*
62. In a survey of Bell Laboratories' personnel, only 3 percent of travelers would be willing to substitute a system which did not provide video capability.	*Snyder, 1973*
63. Patients prefer color video to audio for communicating with a doctor during remote diagnosis.	*Conrath, Dunn, Bloor, and Tranquada, 1976* *Not supported in Moore, Willemain, Bonanno, Clark, Martin, and Mogielnicki, 1975*
64. Doctors are more confident in their diagnoses of patients by video or face-to-face than by audio.	*Moore, Willemain, Bonanno, Clark, Martin, and Mogielnicki, 1975*

EVALUATIONS OF FACE-TO-FACE CONFERENCING

STRENGTHS

Face-to-face meetings are particularly important for intense, interpersonal communication tasks.

1. Face-to-face is better than audio or video for interpersonal relations and for conflict.	*Champness, 1972a*
2. Meetings which emphasize "conflict" probably should be conducted via face-to-face rather than via audio or video.	*Wichman, 1970* *La Plante, 1971, in Short, Williams, and Christie, 1976* *Dorris, Gentry, and Kelley, 1972, in Williams, 1974c* *Short, 1972a* *Williams, 1974b*
3. Meetings which emphasize "negotiation" should be conducted via face-to-face rather than via audio or video.	*Morley and Stephenson, 1969; 1970* *Champness, 1971* *Short, 1971a,b*
4. Face-to-face is better than both audio and video for persuasion.	*Short, 1973b*
5. Meetings for "disciplinary interview" should be conducted via face-to-face rather than via audio or video.	*Williams, 1975a*
6. Meetings for "presentation of a report" can be conducted more effectively via face-to-face than via audio or video.	*Williams, 1975a*
7. The most important aspects of social interaction are transmitted in the visual channel.	*Argyle, 1969*

Face-to-face meetings promote greater information exchange than audio or video.

8. Time spent for maintaining group organization is less for face-to-face than for either video or audio.	*Weston, Kristen, and O'Connor, 1975*

9. More possible solutions to a problem are discussed in face-to-face than in audio before reaching a decision.	*Davies, 1971a,b* *Champness, 1971*
10. More messages are exchanged face-to-face than via other media in a given amount of time.	*Chapanis, Ochsman, Parrish, and Weeks, 1972* *Chapanis, 1973* *Chapanis and Overby, 1974* *Ochsman and Chapanis, 1974* *Weeks and Chapanis, 1976*

Face-to-face is a "friendly" medium.

11. Face-to-face meetings are more friendly than video meetings.	*Williams and Holloway, 1974*
12. In face-to-face meetings, people are much more likely to address their remarks to the group as a whole; in audio or video meetings, there is more tendency to address individuals or a subgroup.	*Weston, Kristen, and O'Connor, 1975*
13. There is less tendency to inflict pain when a victim is visible than when he is isolated.	*Milgram, 1965*

Face-to-face is more "commanding" than other media.

14. There is a greater tendency to obey commands issued via face-to-face than those issued remotely.	*Milgram, 1965*
15. In controlled experiments in which subjects are ordered to shock another person, subjects are more likely to be obedient when orders are given face-to-face rather than over the telephone.	*Milgram, 1965*

People generally prefer face-to-face to other media.

16. Face-to-face is generally rated more favorably than audio or video.	*Champness, 1972a,b* *Christie and Elton, 1975* *Ryan and Craig, 1975*
17. Discussions held by audio or video are generally judged less favorably than discussions held face-to-face.	*Christie and Elton, 1975* *Champness, 1972a,b* *Ryan and Craig, 1975*

18. Face-to-face is preferred over teleconferencing for meetings which are important or complex.	*Connors, Lindsey, and Miller, 1976*
19. People are generally more confident in their perceptions of others based on face-to-face meetings than those based on either audio or video, though they are not necessarily more accurate.	*Reid, 1970*
20. A doctor's confidence in a diagnosis is greater in face-to-face situations than in either audio or video situations.	*Moore, Willemain, Bonanno, Clark, Martin, and Mogielnicki, 1975* *Not replicated in Conrath, Dunn, Bloor, and Tranquada, 1976*
21. Patients prefer face-to-face to remote diagnosis via either audio or video.	*Conrath, Dunn, Bloor, and Tranquada, 1976*

EVALUATIONS OF FACE-TO-FACE CONFERENCING

WEAKNESSES

While face-to-face is preferred for many communication tasks, it may not be necessary.

22. Only about 30 percent of all business meetings actually require face-to-face contact.	*Christie and Elton, 1975 (3 CSG surveys)*

The "personal" nature of face-to-face may inhibit communication in some situations.

23. Face-to-face communication is more dependent on interpersonal or interparty considerations than is audio.	*Morley and Stephenson, 1969; 1970* *Short, 1971a; 1974*
24. In negotiation situations, face-to-face meetings (and video meetings) emphasize the affective content of messages compared to audio or written media.	*Wichman, 1970* *La Plante, 1971, in Short, Williams, and Christie, 1976*
25. In conflict situations, face-to-face may create visual distractions which reduce participants' concentration on their arguments and those of others.	*Short, Williams, and Christie, 1976*
26. For meetings of short duration where long travel time is involved, persons will prefer to telecommunicate rather than attend a face-to-face meeting.	*Christie and Kingan, 1976* *Duncanson and Williams, 1973*
27. Face-to-face meetings tend to be dominated by one person, thus limiting the range of ideas suggested and the quality of the final decisions.	*Hiltz, 1975a* *Hiltz and Turoff, 1976*

A Classification of Social Evaluations of Teleconferencing

Citation	Organizational affiliation	Type of study	Medium(ia) used	Number and type of participants	Length of media usage	Conferencing arrangements	Task(s) or purpose(s) of conferencing usage
Argyle, 1969	Oxford University	Theoretical analysis; literature review	Primarily face-to-face	Primarily subjects*	--	Varied	Varied
Argyle, Lalljee, and Cook, 1968	Oxford University	Laboratory experiments	Face-to-face; simulated audio	Subjects (28 students at University of Delaware; 32 students at Oxford; 80 middle-aged adult education students)	Brief**	Dyads	Interviews
Bashshur, 1975	University of Michigan	Literature review; theoretical analysis	Video	--	--	Medical professional to patient	Remote diagnosis
Bretz, 1974	Rand Corporation	Field test	Video (the MRC system)	Senior and middle level personnel	3 years	Multipoint	Varied
British Columbia Telephone, 1974	British Columbia Telephone	Field test	Video	134 British Columbia Telephone employees, businessmen, students (no cost to users)	Varied	Group-to-group	Varied business meetings
Casey-Stahmer and Havron, 1973	Human Sciences Research, Inc.	Survey (interviews); theoretical analysis	Bell Canada: video; DINA: audio + facsimile; DOC: audio + graphics; FNCB: video + graphics	7 middle level personnel at Bell Canada; 8 middle level personnel at Department of Indian and Northern Affairs; 6 middle level personnel at Department of Communications, Canada; 4 senior managers at First National City Bank (NY)	Bell Canada, DINA, DOC: several months; FNCB: 12 years	Group-to-group	Bell Canada: demonstration; DINA: coordination with remote sites of DINA; DOC: experimental; FNCB: management meetings
Champness, 1971	Communicatons Studies Group	Laboratory experiment	Face-to-face; television; audio	214 male subjects	Brief	Group-to-group (2 acquaintances, 2 strangers)	Bargaining
Champness, 1972a	Communications Studies Group	Laboratory experiment	Audio; close-up television; broader view television	112 subjects (senior British civil servants)	Brief	Dyads	Varied
Champness, 1972b	Communications Studies Group	Laboratory experiment	Face-to-face; loud-speaking audio; closed-circuit television	72 subjects (managerial British civil servants)	Brief	Dyads	Discussion of personal choices (from Kogan and Wallack's "Choice Dilemmas" questionnaires)
Champness, 1973	Communications Studies Group	Survey (questionnaires)	Video	200 subjects (middle level British Post Office personnel)	Brief (almost 75 percent were first-time users)	Group-to-group	Information exchange; trying out Confravision
Champness and Reid, 1970	Communications Studies Group	Laboratory experiment	Face-to-face; simulated audio; telephone	72 subjects (male students)	Brief (about 5 minutes per medium)	Dyads	Communication of contents of a business letter
Chapanis, 1973	Johns Hopkins University	Laboratory experiment	Typewriting; handwriting; simulated audio; face-to-face	Subjects (40 high school boys, 32 Johns Hopkins students)	Brief	Dyads	Finding address of a physician closest to a hypothetical residence, assembling a trash can carrier; similar simple problems
Chapanis, Ochsman, Parrish and Weeks, 1972	Johns Hopkins University	Laboratory experiment	Typewriting; handwriting; simulated audio; face-to-face	40 subjects (high school boys)	Brief	Dyads	Finding address of a physician closest to a hypothetical residence; assembling a trash can carrier; similar simple problems

Chapanis and Overbey, 1974	Johns Hopkins University	Laboratory experiment	Audio; typewriting	32 subjects (college students)	Brief period for each of 4 days	Dyads	Finding address of a physician closest to a hypothetical residence; assembling a trash can carrier; similar simple problems
Christie, 1974a	Communications Studies Group	Laboratory experiment	3 different types of audio; black-and-white television	36 subjects (American business executives)	5 minutes per medium	Group-to-group (3 per group)	General discussion
Christie, 1974b	Communications Studies Group	Survey (interviews)	Video	13 middle level personnel at Department of Environment, London	One group: 6 months; other group: 1 meeting	Group-to-group	Information exchange; general discussion
Christie, 1974d	Communications Studies Group	Laboratory experiment	Face-to-face; television; telephone; letter; audio	36 subjects (civil servants)	Three 5-minute discussions per person	Dyads	Attempt agreement on ways of reducing rise of crime, cost of housing, and pollution in British cities
Christie, 1975a (Chapter X)	New Rural Society Project	Field test	Stereophonic audio plus facsimile	24 upper and middle level management personnel	6 months	Group-to-group	Business meetings between 2 branches of a bank, 45 miles apart
Christie and Elton, 1975	Communications Studies Group	Literature review of Communications Studies Group studies	Audio; video; face-to-face	--	--	--	--
Christie and Holloway, 1975	Communications Studies Group	Laboratory experiment	Audio; video	104 subjects (management level volunteers from business and government	Brief	Group-to-group (2 or 3 per group)	Simulated business meetings
Christie and Kingan, 1976	Communications Studies Group	Laboratory experiment	Audio; video	50 subjects (volunteer civil servants)	Brief (25-50 minutes)	Group-to-group (2 per group)	Media evaluation
Communications Studies Group, 1975	Communications Studies Group	Literature review of Communications Studies Group studies	Audio; video; face-to-face	--	--	--	Varied
Connors, Lindsey and Miller, 1976	National Aeronautics and Space Administration	Survey (questionnaires)	Audio teleconferencing rooms; portable audio (Bell 50A); conference telephone calls	162 senior and middle level personnel from 5 NASA installations	6 months (less than once per month)	Group-to-group and multipoint	Program review; general planning, management; education
Conrath, Bloor, Dunn, and Tranquada, 1976	University of Waterloo; University of Toronto; Flemingdom Health Center (Toronto)	Field experiment	Color television; black-and-white television; still frame black-and-white television, and hands-free telephone	10 doctors (7 male, 3 female); 1 nurse; 1,015 patients visiting a medical clinic (volunteered to be examined via teleconference, as well as normal visit)	Diagnostic session: less than 1 hour per patient; doctors used varied modes	Dyad (physician to patient, with nurse present)	Medical diagnosis
Conrath, Dunn, Swanson, and Buckingham, 1975	University of Waterloo; University of Toronto; Peat, Marwick, and Partners, Toronto	Field experiment	Color television; black-and-white television; hands-free telephone; face-to-face	32 patients; 8 physicians; 6 nurses	Brief (average exam less than 15 minutes)	Dyads (physician to patient, with nurse present)	Remote diagnosis

*"Subject" refers to those paid or unpaid subjects who used the media for simulated tasks; all others used the media to perform their normal activities.

**Brief = less than one hour.

Citation	Organizational affiliaton	Type of study	Medium(ia) used	Number and type of participants	Length of media usage	Conferencing arrangements	Task(s) or purpose(s) of conferencing usage
Craig and Jull, 1974	Communications Research Center, (CRC), Canada	Field experiment	Face-to-face; audio plus graphics	Senior research managers and United Way planning group	Several months	Group-to-group	Normal business meetings
Davies, 1971a	Communications Studies Group	Laboratory experiment	Face-to-face; telephone	40 subjects (British civil servants; 36 males, 4 females)	Brief	Dyads	Factory-location problem (specially developed)
Davies, 1971b	Communications Studies Group	Laboratory experiment	Face-to-face; telephone	Subjects (British civil servants)	Brief	Dyads	Factory-location problem (specially developed)
Dey, 1975	Bell Canada	Descriptive analysis; literature review	Computer-based teleconferencing	Varied	Varied	Multipoint	Varied
Dickson and Bowers, 1973	Cornell University	Literature review and analysis (authors call it a "preliminary technology assessment")	Varieties of the video telephone	--	--	Primarily dyads	--
Duncan, 1969	University of Chicago	Literature review	Primarily face-to-face	Primarily subjects	Varied	Varied	Varied
Duncanson and Williams, 1973	Bell Laboratories	Field test	Video (Bell Laboratories System)	197 senior and middle level Bell Laboratory employees (no cost to users)	Varied	Group-to-group (3-4 per group)	Normal interlaboratory meetings between two Bell Labs locations
Ellis, McKay, and Robinson, 1976	Swinburne Institute of Technology; Telecom Australia	Survey (interviews)	Video (Telecom Australia System)	21 users of the Confravision service who had not continued to use it; paid at rate of $150 per hour	One-half to several hours	Group-to-group	Varied business meetings
Ferguson and Johansen, 1975	Institute for the Future/Lilly Endowment, Inc.	Field test (with postconference questionnaire)	Computer-based teleconferencing	19 senior and middle level personnel (no cost to users)	1 week (with brief training period preceding)	Multipoint	Information exchange; discussion of ideas; policy formulation
Giedt, 1955	--	Laboratory experiment	Written transcripts; sound recordings; film plus sound	48 psychiatrists, social workers, and psychologists	Brief	Dyads	Judging patient via recorded interview
Graham, Ricci Bitti, and Argyle, 1975	Oxford University	Laboratory experiment	Videotape; limited image videotape	Subjects (English and Italian)	Brief	Dyads	Communicating description of a two-dimensional object
Hammond and Elton, 1976	Communications Studies Group	Literature review; descriptive analysis	Audio; video; face-to-face	--	--	--	Varied
Hiltz, 1975a	New Jersey Institute of Technology (NJIT)	Literature review of small group research	Face-to-face	Varied	Varied	Varied	Varied
Hiltz, 1976a	New Jersey Institute of Technology	Literature review of small group research (face-to-face); descriptive analysis	Computer-based teleconferencing; face-to-face	--	--	--	--
Hiltz, 1976b	New Jersey Institute of Technology	Literature review of small group research (face-to-face); descriptive analysis	Computer-based teleconferencing; face-to-face	--	--	--	--

Hiltz and Turoff, 1976	New Jersey Institute of Technology	Descriptive analysis and projections	Computer-based teleconferencing	--	--	--	--
Holloway and Hammond, 1976	Communications Studies Group; Open University	Survey (interviews)	Telephone conference calls	29 students and faculty using the telephone in teaching at the Open University, London	About 1 year	Multipoint	Faculty/student meetings during academic courses
Hough, 1976	Stanford Research Institute	Catalogue and descriptive analysis of existing teleconferencing systems	Audio; video; computer-based teleconferencing	Varied	Varied	Varied	Varied
Irving, 1976	University of Waterloo	Case study; survey (questionnaires)	Computer-based teleconferencing and message-switching	About 40	10 months	Multipoint	Coordination among regional centers of the Nonmedical Use of Drugs Directorate in Canada
Janofsky, 1971	University of Oregon	Laboratory experiment	Telephone; face-to-face	160 subjects (paid student volunteers)	10 minutes	Dyads	Interview to get to to know strangers
Jillson, 1975	Nonmedical Use of Drugs Directorate, Canadian Government	Case study	Computer-based conferencing and response elicitation	About 20	About 2 months	Multipoint	Information exchange and polling
Johansen, Vallee, and Palmer, 1976	Institute for the Future	Preliminary analysis of extended field test	Computer conferencing	About 100 energy researchers	12-15 months	Multipoint	Varied; primarily coordination of energy research projects
Jull, McCaughern, Mendenhall, Storey, Tassie, and Zalatan, 1976	Department of Communications (DOC), Canada	Review of research by Department of Communications, Canada; laboratory experiments and surveys, descriptive analysis	Audio; audio plus graphics; video	Varied	--	Primarily group-to-group	Varied
Jull and Mendenhall, 1976	Department of Communications, Canada	Literature review	Audio; audio plus graphics; video	--	--	Primarily group-to-group	Varied
Kettering Foundation (forthcoming)	Kettering Foundation	Survey	Computer conferencing	About 50 scientists, teachers, and administrators	1-3 months	Multipoint	Varied
Kite and Vitz, 1966	Institute for Defense Analyses	Laboratory experiment	Teletype; audio; face-to-face	Subjects	Several hours	Multipoint	Crisis simulation ("Summit")
Klemmer, 1973	Bell Labs	Theoretical analysis; literature review	Audio; video; face-to-face	--	--	--	Varied
Kupperman and Wilcox, 1975	Personal proposal	Theoretical proposal	Computer-based teleconferencing	--	--	Varied	Crisis management
LaPlante, 1971	University of Windsor	Laboratory experiment (M.A. thesis)	Face-to-face; closed circuit TV; telephone	Subjects	Brief	Dyads	Problem solving ("Prisoners Dilemma" game)
Larimer and Sinclair, 1969	Pennsylvania State University	Field test	Video	22 teachers taking a graduate course at Pennsylvania State University	1 semester	Group-to-group (11 per group)	Graduate seminar in education
Maier and Thurber, 1968	University of Michigan	Laboratory experiment	Face-to-face; audio; written transcript	Subjects	Brief	Subject watching; listening; or reading about the role play	Judging accuracy of role-played situation

Citation	Organizational affiliation	Type of study	Medium(ia) used	Number and type of participants	Length of media usage	Conferencing arrangements	Task(s) or purpose(s) of conferencing usage
Mark, 1975	Varied	Theoretical analysis	Video	--	--	Primarily medical professionals to patients	Primarily remote diagnosis
Mendenhall and Ryan, 1975	Communications Research Center, Canada	Laboratory experiment	Audio; video; face-to-face	51 subjects (middle level civil servants)	Brief (about 30 minutes per medium)	Group-to-group	Personnel management problem
Midorikawa, Yamagishi, Yada, and Miwa, 1975	Electrical Communication Laboratories, Tokyo	Field test	Video plus graphics	About 150 senior and middle level personnel	At least 3 hours	Group-to-group	Business meetings
Milgram, 1965	--	Laboratory experiment	Face-to-face; audio	Subjects	Brief	Dyads	Giving orders
Mintzberg, 1971	McGill University	Participant observation	Face-to-face; telephone; mail	Corporate managers	Varied	Varied	Varied
Moore, Willemain, Bonanno, Clark, Martin, and Mogielnicki, 1975	Cambridge Hospital	Field experiment	Television; telephone	354 patients; 3 practitioner nurses; several physicians	7 months	Dyads (physician to patient, with nurse present)	Remote medical diagnosis
Morley and Stephenson, 1969	University of Nottingham	Laboratory experiment	Variations of face-to-face and telephone	Subjects	40 minutes or less	Dyads	Industrial negotiation problem
Morley and Stephenson, 1970	University of Nottingham	Laboratory experiment	Variations of face-to-face and telephone	Subjects	40 minutes or less	Dyads	Industrial negotiation problem
Mowbray and Gebhard, 1961	Johns Hopkins University	Theoretical analysis	All sensory modes	--	--	Varied	Varied
Murphy and Bird, in Shinn, 1975	--	Field test	Video	1,000 subjects (patients)	--	Telediagnosis; patient, physician, and support personnel	Telediagnosis
Noll, 1976	Bell Laboratories, AT&T	Survey (questionnaires)	Video conferencing	21 senior and middle level personnel sampled from all users of video system at Bell Labs (represents 7 different user groups)	10 video conferences over last year	Group-to-group	Committee-like coordination; information exchange
Ochsman and Chapanis, 1974	Johns Hopkins University	Laboratory experiment	Various combinations of teletype, handwriting, typewriting, video, audio, and face-to-face	120 subjects (male undergraduates at Johns Hopkins University)	Brief	Dyads	Simple problem solving
Panko, Pye, and Hough, 1976	Stanford Research Institute and Communications Studies Group	Technology assessment	Video; audio; telephone	--	--	Varied	Office decentralization
Park, 1975	Alternate Media Center	Literature review; theoretical analysis	Video	Varied	Varied	Medical professionals to patient	Remote diagnosis
Penner and Hawkins, 1971	--	Laboratory experiment	Face-to-face; audio	Subjects	Brief	Dyads	Giving orders

Pye, 1976	Communications Studies Group; Stanford Research Institute	Literature review; descriptive analysis	Audio; video; face-to-face	--	--	--	--
Reid, 1970	Communications Studies Group	Literature review, primarily laboratory experiments	Audio (usually telephone); face-to-face	Primarily subjects (civil servants)	Typically brief	Primarily dyads	Communicating contents of 9,200-word business letter; interviewing
Reid, 1976	British Post Office	Literature review, primarily laboratory experiments	Telephone; face-to-face	Primarily subjects	Typically brief	Primarily dyads	Varied
Ryan, 1975	Communications Research Center, Canada	Laboratory experiment	Audio; video; face-to-face	Subjects (51 civil servants)	Brief	Group-to-group	Case study problem ("The Tardy Staff")
Ryan and Craig, 1975	Communications Research Center, Canada	Laboratory experiment	Video; audio; face-to-face	51 subjects (Canadian middle and senior level civil servants)	Brief	Group-to-group (3-5 per group)	Solving problem of a tardy employee
Ryan and Cummings, 1973	Communications Research Center, Canada	Survey (questionnaires)	--	120 subjects (French- and English-speaking undergraduates)	--	--	Subjects surveyed about their attitudes toward computer
Short, 1971a	Communications Studies Group	Laboratory experiment	Face-to-face; telephone	60 subjects (civil service college volunteers)	Brief	Dyads	Industrial negotiation problem (labor-management)
Short, 1971b	Communications Studies Group	Laboratory experiment	Face-to-face; telephone	64 subjects (civil service college volunteers)	Brief	Dyads	Mixed-motive bargaining game
Short, 1972a	Communications Studies Group	Laboratory experiment	Face-to-face; audio; video	120 subjects (British civil servants)	Brief	Dyads	Arguing opposite points of view on social issues
Short, 1972b	Communications Studies Group	Laboratory experiment	Face-to-face; audio, video	Subjects	Brief	Dyads	Arguing opposite points of view on social issues
Short, 1972c	Communications Studies Group	Laboratory experiment	Face-to-face; audio; video	Subjects	Brief	Dyads	Arguing opposite points of view on social issues
Short, 1973a	University College, London	Laboratory experiment (Ph.D. thesis)	Face-to-face; audio; video	Subjects	Brief	Dyads	Arguing opposite points of view on social issues
Short, 1973b	Communications Studies Group	Laboratory experiment	Face-to-face; audio; video	Subjects	Brief	Dyads	Arguing opposite points of view on social issues
Short, 1973c	Communications Studies Group	Survey (interviews)	Audio (Bell 50A sets)	12 administrators and faculty at the University of Quebec	Regularly for at least 1 year	Group-to-group	Administrative meetings
Short, 1974	Communications Studies Group	Laboratory experiment	Telephone; face-to-face	Subjects	Brief	Dyads	Mixed-motive bargaining game
Simon, Fleis, Fisher, and Burland, 1974	New York State Department of Mental Hygiene	Field experiment	Face-to-face; telephone	85 incoming psychiatric patients	Brief	Dyads (social scientist to patient)	Admissions interviews for psychiatric care
Short, Williams, and Christie, 1976	Communications Studies Group	Literature reivew and descriptive analysis (based primarily on CSG research)	Audio; video; face-to-face	Varied, but primarily subjects	Varied, but typically brief	Varied, but primarily dyads	Varied

Citation	Organizational affiliation	Type of study	Medium(ia) used	Number and type of participants	Length of media usage	Conferencing arrangements	Task(s) or purpose(s) of conferencing usage
Sinaiko, 1963	Institute for Defense Analyses	Laboratory experiment	Teletype; telephone; split-screen television	Subjects	Several hours	Multipoint for audio and teletype; group-to-group for television	Crisis simulation ("Summit")
Snyder, 1973	Bell Laboratories	Survey (questionnaires)	Varied	3,777 employees at Bell Labs (with travel between Bell Laboratory sites over a 1-month period)	Varied	Varied	--
Spelt, 1977	Wabash College	Survey (questionnaires); content analysis	Computer-based teleconferencing	8 psychology professors at small colleges	20 days	Multipoint	Development of a computer simulation for use in psychology courses
Stapley, 1973	Communications Studies Group	Survey (questionnaires); descriptive cost analysis	Audio (Remote Meeting Table)	3 separate surveys of RMT users, senior and middle level personnel	Varied	Group-to-group	Varied
Stapley, 1974	Communications Studies Group	Review and descriptive analysis	Audio; video	Senior and middle level personnel	Varied	Group-to-group	Varied
Strickland, Guild, Barefoot, and Patterson, 1975	Carleton University	Laboratory experiment	Face-to-face; video	Subjects (university students)	Brief	Group-to-group	Simulated tasks
Thomas and Williams, 1975	Communications Studies Group	Survey (questionnaires)	Audio (Bell 50A sets)	186 administrators and faculty at the University of Quebec	Most had used the system at least 5 times	Group-to-group	Administrative meetings
Turoff, 1972b	Office of Emergency Preparedness (U.S. Government)	Descriptive analysis; cost analysis	Computer-based teleconferencing	Officials in U.S. Office of Emergency Preparedness	About 1 year	Multipoint	Coordination of responses to emergency situations (e.g., "Price Freeze" in United States)
Turoff, 1974a	Office of Emergency Preparedness (U.S. Government)	Descriptive analysis	Computer-based teleconferencing	Officials in U.S. Office of Emergency Preparedness	Several years	Multipoint	Coordination of responses to emergency situations
Turoff, 1975	New Jersey Institute of Technology	Descriptive analysis, based on previous experience	Computer-based teleconferencing	Senior and middle level personnel	--	Multipoint	Coordination of responses to emergency situations (e.g., "Price Freeze" in United States)
Turoff, 1976	New Jersey Institute of Technology	Descriptive analysis, cost analysis	Computer-based teleconferencing	--	--	Multipoint	--
Vallee and Askevold, 1975	Institute for the Future/U.S. Geological Survey	Field test	Computer-based teleconferencing	About 20 senior and middle level personnel	About 6 months	Multipoint	Information exchange; discussion of data base on mineral reserves
Vallee, Johansen, Lipinski, Spangler, and Wilson, 1975	Institute for the Future (IFTF)	Field test	Computer-based teleconferencing	About 150 middle level personnel (28 separate conferences; no cost to users)	1 week to 6 months	Multipoint	Primarily information exchange and discussion of ideas
Vallee, et al. (forthcoming)	Institute for the Future	Survey	Computer-based teleconferencing	70 middle and senior level users of the PLANET computer conferencing system	Varied	Multipoint	Varied
Vallee and Wilson, 1976	Institute for the Future/National Aeronautics and Space Administration	Field test	Computer-based teleconferencing; audio	13 experts working on a NASA contract and 15 principal investigators on the Communications Technology Satellite	About 8 months	Multipoint (the single audio conference was group-to-group)	Project coordination; information exchange; emergency messages

Wall and Boyd, 1971	--	Laboratory experiment	Face-to-face; written messages; videotape	Subjects	Brief	Dyads	Opinion change exercise
Wapner and Alpen, 1952	Clark University	Laboratory experiment	Seen and unseen audience	120 subjects (60 male, 60 female undergraduates)	Brief	Person-to-group	Problem solving
Weeks and Chapanis, 1976	Johns Hopkins University	Laboratory experiment	Audio; video; face-to-face; teletype	96 subjects (male undergraduates at Johns Hopkins University)	Brief	Dyads	2 cooperative problems; 2 conflictual problems
Wempner, 1975	U.S. Department of Health, Education, and Welfare	Survey (questionnaires)	Video	7 physicians who had used telemedicine systems	Varied	Physician-to-patient	Remote diagnosis
Weston and Kristen, 1973	Carleton University; University of Montreal	Field experiment	Audio plus graphics; video; face-to-face	About 50 subjects (students, sampled from a population of 650)	3 consecutive weeks, one 45-minute session per week	Group-to-group	Course evaluation
Weston, Kristen, and O'Connor, 1975	Carleton University; University of Montreal	Further analysis of data from Weston and Kristen, 1973	Audio plus graphics; video; face-to-face	About 50 subjects (students, sampled from a population of 650)	3 consecutive weeks, one 45-minute session per week	Group-to-group	Course evaluation
Westrum, 1972	Purdue University	Survey (questionnaires) (Ph.D. dissertation)	Letter; telephone; face-to-face	Sample of U.S. senior and middle level business people	Varied	Varied	--
Wichman, 1970	Claremont Graduate School	Laboratory experiment	Face-to-face; simulated audio; written notes	88 subjects (paid female students at Claremont)	Brief	Dyads	Problem solving ("Prisoners Dilemma")
Williams, 1972a	Communications Studies Group	Laboratory experiment	Face-to-face; video; audio	Subjects	Brief	Dyads	Free discussion; conflicts of opinion
Williams, 1973	Communications Studies Group; Bell Canada	Survey (interviews)	Video (Bell Canada's conference television system)	26 senior and middle level Bell Canada employees (no cost to users)	Primarily repeated users	Group-to-group	General business meetings
Williams, 1974c	Communications Studies Group	Literature review, primarily of laboratory experiments	Video; audio; face-to-face	Primarily subjects	Typically brief	Primarily dyads	Varied
Williams, 1975a	Communications Studies Group	Laboratory experiment	Face-to-face; closed-circuit television; audio	180 subjects (middle level executives and administrators from civil service and nationalized industries)	30 minutes for each group	Group-to-group (2 per group)	Generation of ideas about problems of traveling in Britain
Williams, 1972b	Communications Studies Group	Laboratory experiment	Audio; video; face-to-face	Subjects	Brief	Dyads	Conflictual task
Williams, 1975c	Communications Studies Group	Descriptive analysis	Varied types of audio	--	--	Group-to-group; multipoint	Varied
Williams, 1976a	Communications Studies Group	Literature review of laboratory experiments	Audio; video; face-to-face	Primarily subjects	Typically brief	Primarily dyads	Varied
Williams, 1976b	Communications Studies Group	Literature review of laboratory experiments; analysis of findings	Audio; video; face-to-face	Primarily subjects	Typically brief	Primarily dyads	Varied
Williams and Holloway, 1974	Communications Studies Group; Bell Canada	Survey (questionnaires)	Video (Bell Canada's conference television system)	190 senior and middle level personnel (63 from Bell Canada, others from other Canadian organizations; no cost to users)	Most had used the the system only once	Group-to-group	Information exchange; problem solving

Citation	Organizational affiliation	Type of study	Medium(ia) used	Number and type of participants	Length of media usage	Conferencing arrangements	Task(s) or purpose(s) of conferencing usage
Wilson, 1974	Communications Studies Group	Theoretical analysis; comparison with experimental findings	--	--	--	--	--
Wish, 1975	Bell Laboratories	Survey (questionnaires)	Picturephone®; telephone; face-to-face	Middle and senior level personnel	Varied	Varied	Varied
Woodside, Cavus, and Buck, 1971	Bell Northern Research	Laboratory experiment	Speakerphone; face-to-face; Project 91 videophone	36 engineers from Bell Northern Research	Brief	Dyads	Resource allocation
Young, 1974a	Communications Studies Group	Laboratory experiment	Audio; television; face-to-face	36 subjects (18 students as interviewees, 18 experienced interviewers)	Brief	Dyads	Simulated interview for civil service employment
Young, 1974b	Communications Studies Group	Laboratory experiment	Face-to-face; audio	48 subjects	Brief	Dyads	Arguing opposite points of view on social issues
Zinn, 1977	University of Michigan	Case study	Computer-based teleconferencing	Over 100 students and faculty, primarily at University of Michigan	Varied	Multipoint	Professional communication; adjunct to face-to-face convention; courses
Zinn, Parnes, and Hench, 1976	University of Michigan	Case study	Computer-based teleconferencing	About 50 students and faculty at University of Michigan	Several months	Multipoint	Courses; faculty meetings

A CATALOG OF REPRESENTATIVE SYSTEMS FOR TELECONFERENCING

In the last 10 years, many organizations in the United States, Great Britain, Canada, Australia, Japan, and other parts of the world have begun to experiment with teleconferencing systems. While this catalog is not a complete inventory of these systems (such an inventory would be out-of-date almost immediately), it does summarize some typical approaches to teleconferencing. Each of the 36 entries lists the name of a system or the organization supporting it, together with an address for additional information. Also, a summary of the technical capabilities and the experience to date is given whenever it is available.

It is quite important to make a distinction between "multisite" systems, which support conferences among at least three locations, and "two-site" systems, which only link two sites at any given time (although the systems may have several operating sites). All computer-based systems[15] cited here support multisite conferences; so do 9 of the audio systems; but only 5 out of 19 of the video systems are multisite systems.

It is also important to distinguish among systems which are still experimental and have not been offered to real-world users, systems that are currently in active use, and systems which have been discontinued (these are included here only to provide a historical perspective).

If we consider only those systems which support multisite conferencing and are currently operational (designated by a dot before the entry), we find *5 video systems, 8 computer systems, and 8 audio systems.*

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[15] We have excluded from our survey all computer-based systems for "electronic mail," which only support delayed interaction, as well as the direct point-to-point "links" offered by some computer networks.

VIDEO TELECONFERENCING SYSTEMS

AUSTRALIAN POST OFFICE (Australia, two-site, operational)
Contact: Telecom Australia Research Labs, 59 Lt. Collins St., Melbourne, Victoria 3000, Australia

In 1969, the Australian Post Office began experimenting in Melbourne with two conference rooms one mile apart. Meetings were found to be routine and frequent, and in 1972, a third studio was added in Sydney. Six participants can be accommodated at each of the studios, using two cameras for viewing the conferees and one for graphics. Two monitors display the incoming signal, with three participants on each screen. There is no self-view unless the chairman switches manually to this mode.

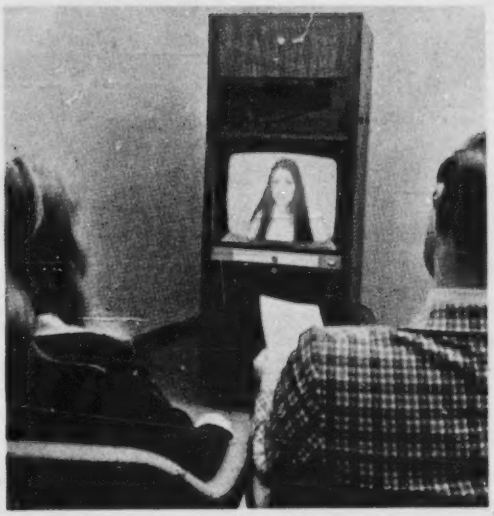
BANKERS TRUST COMPANY (United States, two-site, discontinued)
Contact: Bankers Trust Company, 280 Park Avenue, New York, NY 10017

This system was similar to the previous one in both design and use. It was limited to two conference locations. It operated between 1963 and 1968, when it was determined to be too costly.

BELL CANADA (Canada, two-site, operational)
Contact: Special Services, Bell Canada, 620 Belmont, Room 1020, Montreal, Quebec, Canada

The Bell Canada Conference Television system has four studios. At present, only two-site connections are possible, although simultaneous conferences among two pairs of studios can be supported. The main cameras have a fixed focus. A graphics camera (overhead) and a display camera (tripod) are also available. Three of the studios accommodate nine persons, and one studio seats six people.

One evaluation based on questionnaire responses indicates a high level of satisfaction among users, although, compared to face-to-face, the meetings were judged less "active" and less "friendly." A market study indicated that users were concerned over confidentiality and overall picture quality.



Bell Canada's portable video system

BELL LABS (United States, two-site, operational)
Contact: Bell Laboratories, Murray Hill, NJ 07974

This is a private video conferencing system operating between Murray Hill and Holmdel, New Jersey. Usage began in 1967, primarily for experimental purposes. Five cameras are used (three focused on participants, one overview camera, and one overhead graphic camera) within each room. Four monitors are available, three of which show the remote studio while the fourth displays the local studio. One of the conference rooms seats nine persons; the other, six. The cameras are activated by voice, with "cough buttons."

It is reported that the system works best for committee-type discussions and is perceived as more satisfactory than telephone and face-to-face for regular communication and the exchange of information.

BRITISH COLUMBIA TELEPHONE (Canada, two-site, experimental)
Contact: Trans Canada Telephone, 160 Elgin, Ottawa, Ontario K1G 3J4, Canada

This system was developed experimentally by British Columbia Telephone to assess the marketability of video conferencing in 1973. The two-studio system was intended for use by the business community. The conference rooms,

located in Vancouver and Victoria, were simply designed, and technical equipment was unobtrusive. One camera was used to view all four participants, with one monitor showing the incoming signal and one monitor showing the local room. In addition, a graphics transmission monitor was provided. Two desk microphones provided the audio channels.

Because of the experimental nature of the system, off-camera observers were seated in the conference room with monitors directly in front of them. During the six-week experiment, it was found that situations involving a large group at either station decreased the need for two-way visual communication. In particular, one-way transmission was sufficient for classroom-type situations. There was a definite learning curve: those who used the system over longer periods were less distracted by it and participated more freely.

- CONFRAVISION (Great Britain, multisite, operational)
  Contact: Post Office, Telecommunications Headquarters, 207 Old Street, London EC1V 9PS, England

Confravision began in 1967 as an internal link between two offices operated by the British Post Office. It has now expanded to include six sites in five U.K. cities. The system can accommodate three-studio conferences, with up to five participants at each studio. Within the studio, a single camera is used in one of two positions: a full group view or a close-up view of three participants. The camera positions are controlled by the chairperson or secretary. The system is completely open; neither microphones nor camera are voice-switched. A camera mounted on the ceiling transmits graphics.

User reaction to Confravision has reportedly been favorable although usage has lagged behind the projected level. The medium has been judged best for tasks that do not involve personal matters or depend on personalities (such as selling or bargaining).

DEPARTMENT OF THE ENVIRONMENT (Great Britain, two-site, discontinued)
Contact: Department of the Environment, London, England

This system was constructed in late 1972 to link two offices in London. Although its availability was widely known, it received very limited use during its first trial period of one year. Most of the criticisms centered on the inability to display charts and maps, which are an integral part of the Department's work. Further concern was expressed over the formal atmosphere of the system. Junior executives felt uneasy about asking senior personnel to participate.

DOW CHEMICAL COMPANY (United States, two-site, operational)
Contact: Gordon Lee, Dow Chemical Company, Midland, Michigan 48640

As a result of rising travel costs, Dow decided to install a video system in 1974 to link facilities in Michigan and Texas. Two conference rooms were linked at a reported cost of over $1 million. The rooms resemble television studios, using mobile cameras (with cameramen), a director, and an engineer. All cameras are equipped with zoom lenses, and the system handles slides, graphics, and blackboard presentations. It has full-color capability.

ELECTRICAL COMMUNICATIONS LABORATORIES (Japan, two-site, experimental)
Contact: Electrical Communications Lab, Nippon Telegraph & Telephone Corporation, Musachino-shi, Tokyo, 180, Japan

In 1973, the Nippon Telephone & Telegraph Company established this experimental, private video system with five conference studios. In each studio, three monochromatic cameras display the conferees, and four monitors show the local and the remote locations. The system has been well received and regularly used. Technical problems occur routinely, but none have been serious.

ERDA VISUAL CONFERENCE SYSTEM (EVCS) (United States, two-site, operational)
Contact: Bob Louis, Division of Communication and Computer Operations, U.S. Energy Research and Development Administration, Washington, DC 20545

Connecting ERDA offices in downtown Washington, DC, and Germantown, Maryland (about 20 miles apart), this system is leased from AT&T and is similar to the Picturephone® Meeting Service. It began operation in the spring of 1976 and may eventually be linked to other ERDA centers around the United States. Initial evaluations have been positive, and the system has been used quite heavily.

FIRST NATIONAL CITY BANK (United States, two-site, discontinued)
Contact: First National City Bank, 399 Park Avenue, New York, NY 10022

In the early sixties, this bank moved key executives to a new location within New York City and felt it was critical to retain immediate access to the Wall Street office. Four conference rooms were set up, each using a fixed camera displaying all the participants at a rectangular table. Two monitors and two long-reach microphones were installed at the end of the room. A graphics camera was positioned near the chairman in an overhead position. This system was one of the earliest attempts at video conferencing. It was finally abandoned due to high costs, although use was regular.

- NATIONAL AERONAUTICS AND SPACE ADMINISTRATION (NASA) (United States, multisite, operational)
  Contact: John Chitwood, Code 951, NASA Goddard Space Flight Center, Greenbel MD 20771

  NASA is certainly one of the most experienced teleconference users. This video system (including a facsimile-sending capability) links the Ames Research Center in California with the Goddard Space Flight Center in Maryland and the Lewis Research Center in Ohio. The system uses the Communications Technology Satellite. This test is being evaluated for technical performance and teleconferencing effectiveness.

- NEW YORK METROPOLITAN REGIONAL COUNCIL (United States, multisite, operational)
  Contact: Metropolitan Regional Council, One World Trade Center, New York, NY 10023

  This system, known as MRC, was introduced in 1969 but did not become operational until 1974. It is used primarily for continuing education, personne management, and purchasing. Nine studios in county seats around New York City are equipped with a monitor and remotely controlled camera. All signals from these remote locations are received and transmitted by a central studio located at the World Trade Center. If more than two sites are active, a split-screen technique is used. The audio system is open, allowing for free interruptions. A request-to-talk button at each studio can also be used to seek recognition.

  The system appears to have been well received and is presently in use. Most programming, however, is in the broadcast mode, originating from the World Trade Center Headquarters. There have been problems related to backup systems, split-screen effects, and tranmission of visual aids.

The MRC system

NEW YORK TELEPHONE COMPANY (United States, two-site, operational)
Contact: New York Telephone Company, Two World Trade Center, New York, NY 10048

This video system was established in 1966 for internal management purposes. Four regional headquarters are connected (three in New York City and one in Albany). Each room has three cameras: one displays the conferees; one focuses on the blackboard or the easel; and an overhead camera shows graphics. A single microphone is used.

● NIPPON STEEL WORKS (Japan, multisite, operational)
Contact: Yawata Steel Works, Nippon Steel Company, Yawata, Japan

Three conference rooms are available, each of which uses three cameras to display participants, a blackboard, and graphics. The system is said to be heavily used by managers at all 3 locations, which are 10 to 30 miles apart.

NIPPON TELEPHONE AND TELEGRAPH (Japan, two-site, operational)
Contact: Nippon Telephone and Telegraph, 1-6, Uchisaiwai-cho 1-Chome, Chiyoda-ku, Tokyo 100, Japan

This system is an outgrowth of the experimental system described above. Commercial service began in 1976 between Tokyo and Osaka. Three color cameras display the conferees: two group cameras show three participants each. A chairman's camera can provide close-ups of any participant. A blackboard camera also provides visual capabilities for presentations, and three overhead cameras show graphics. Two monitors show the remote room, and two side monitors show the local room. High-speed facsimile equipment is also provided. The rate charged for use of the system is $400/hour. Although still in its initial stages, the system has been used for 11 paid commercial conferences during the period from May to October 1976.

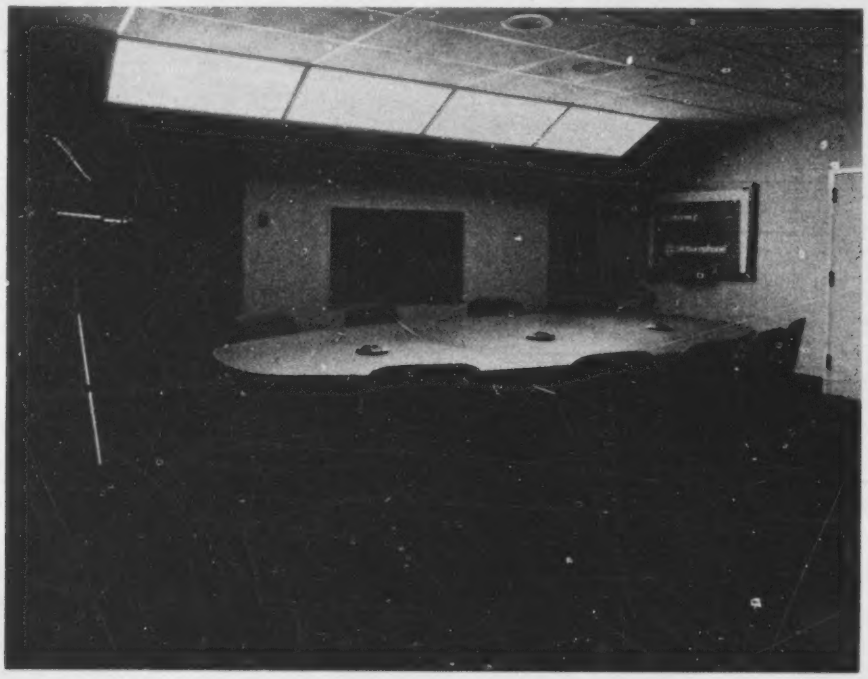
- OMAHA VETERANS HOSPITAL (United States, multisite, operational)
  Contact: Director, CCTV, Omaha Veterans Hospital, Omaha, NE 68105

Originally undertaken in 1970, this system is used for both teaching and diagnostics. Nine institutions are linked together through a central location which controls the audio-video signal during multisite conferences. All groups can then hear all other groups. The video signal is controlled by an operator at the central location and manually switched to the remote studios. Thus, any conferee can be heard at all times, but only one video signal is received, at the operator's discretion.

Users report that the system saves time and is especially useful for faculty-student relations. Diagnostic discussions via the medium seem to be effective.

PICTUREPHONE® MEETING SERVICE (United States, two-site, operational)
Contact: Visual Communications Services, AT&T, 295 North Maple Avenue, Basking Ridge, NJ 07920

The Picturephone® allows interaction among any two of the studios installed by AT&T in San Francisco, Chicago, New York, and Washington, DC. Cameras are voice-switched, showing two persons at a time at a table seating six. An overview of the whole group can be transmitted at the will of the chairperson or automatically if no one is speaking. There is a graphic station for documents and a facsimile transmission facility. A display area for larger charts and displays is accessible with a tripod camera. Individual microphones are used.



WESTINGHOUSE COMMUNICATIONS TECHNOLOGY SATELLITE TEST (United States, two-site, operational)

Contact: Herb Nunnally, Westinghouse Electric Company, P.O. Box 1693, Mail Stop 973, Baltimore, MD 21203

Westinghouse is currently testing a video conferencing link between Baltimore, Maryland, and Lima, Ohio, using a signal which is sent over the Communications Technology Satellite. One of its unique characteristics is the use of Advent® video projectors to cast a 4x6-foot image of participants at the remote locations (the room needs to be darkened to do this). Six persons can be in each studio, with three on camera at a given time. There are two voice-switched cameras in each studio. The system is being evaluated in terms of potential cost savings over travel and performance/reliability.

COMPUTER TELECONFERENCING SYSTEMS

- COMPUTER-MEDIATED INTERACTION (Canada, multisite, operational)
  Contact: Bell Canada/BNR, 620 Belmont Street, Montreal, Canada

  Three levels of CMI have been tested by Bell Canada and Bell Northern Research. The first one was an adaptation of the DISCUSSION system of the Office of Emergency Preparedness. The second one was an internal prototype. The third one was released for evaluation by selected groups in early 1976. This third system uses a minicomputer (PDP 11/40) and allows users to participate in a "global" mode, a "notebook" mode, and an "edit" mode which permits insertions, deletions, and reformatting. An internal review has been performed, but no information has been released on actual usage or performance.

- CONFER (Great Britain, multisite, operational)
  Contact: National Physical Laboratory, Teddington, Middlesex, TW11 0LW, England

  This private system runs on a PDP 11/40 at the National Physical Laboratory in England. The chairman of a conference has total authority to edit messages, reorder them, or delete them before they are seen by others or become part of the public record.

CONFER, UNIVERSITY OF ILLINOIS (United States, multisite, experimental)
Contact: George Carter, Department of Electrical Engineering, University of Illinois, Urbana, IL 61801

Begun in 1973 at the University of Illinois, this program is part of the PLATO system on a CYBER-73 computer. The original idea was to extend computer-assisted instruction to community participation and group discussions. It is not used significantly due to local computer constraints.

- CONFER, UNIVERSITY OF MICHIGAN (United States, multisite, operational)
  Contact: Robert Parnes or Karl Zinn, CRLT, 109 East Madison, Ann Arbor, MI 48104

  This conferencing system is written in Fortran and runs on an IBM 370 computer on the MERIT computer network within the State of Michigan, as well as on TELENET. It is used for university committee meetings, group discussions,

and some classes. The system is similar in structure to Partyline and Discussion and has options for various forms of structured interaction and voting.

- ELECTRONIC INFORMATION EXCHANGE SYSTEM (United States, multisite, operational)
  Contact: Murray Turoff, New Jersey Institute of Technology, 323 High Street, Newark, NJ 07102

  Design and implementation of this system began in 1975 using an Interdata 7/32 minicomputer available through TELENET. There are four distinct communications structures: (1) a message system which allows the user to address any individual, group of individuals, or the system itself (messages disappear about two weeks after delivery); (2) a conferencing system which includes the capability for any user to set up a temporary conference and invite others to join it; (3) notebooks which are 50 pages of private storage/text development and editing space allocated to each user; and (4) an online bulletin or minijournal for each group on the system. Use is restricted to small scientific communities engaged in a common research specialty area or to other experimental/research uses in scientific, engineering, and technical fields, as approved by the Division of Science Information of the National Science Foundation.

GENERAL CONFERENCING SYSTEM (Canada, multisite, status uncertain)
Contact: Bert Liffmann, c/o I. P. Sharp, 145 King West, Toronto, Ontario, Canada

This system runs on an IBM 370/155 on the I. P. Sharp Network and began operations from Ottawa in 1974. Participants were located within the United States and Canada. Initial research was sponsored by the Canadian Government, with major use by the Department of Health and Welfare.

- INFOMEDIA (United States, multisite, operational)
  Contact: Jacques Vallee, 430 Sherman Avenue, Palo Alto, CA 94306

  This organization is the first corporation formed in the United States for the purpose of marketing computer conferencing systems. It is developing several lines of products, including: TOPICS, which is a program developed jointly with Control Data Corporation, runs on CDC 6600 computers, and serves as a general-purpose electronic mail and conferencing system; NOTEPAD, which is oriented toward disseminated task forces and integrates file management and information retrieval. It is also making the PLANET system available commercially under license from the Institute for the Future. The company began operations in 1976 and plans to offer future systems on dedicated minicomputers.

- MINT (Canada, multisite, operational)
  Contact: Craig Taylor or Hugh Pett, Nonmedical Use of Drugs Directorate, Department of Health and Welfare, 365 Laurier Street West, Ottawa, Ontario, Canada K1A 1B6

  MINT is a management information system for the Nonmedical Use of Drugs Directorate. It has message switching and conferencing capabilities. Message-switching is the communications capability used most frequently, with some informal conferences also taking place over the system. The program is written in Fortran for an Interdata 732 computer and operates on the Comshare computer network in Canada.

- PARTYLINE AND DISCUSSION (United States, multisite, operational)
  Program tape available as "DEP Conferencing System" from: National Technical Information Service, 5285 Port Royal Road, Springfield, VA 22151
  Authors: Rod Renner and Murray Turoff

  Developed at the Office of Emergency Preparedness (now Federal Preparedness Agency, GSA), these systems were designed for synchronous (real-time) and asynchronous (delayed) communication. The program is now available publically through NTIS and is currently in use at the University of Wisconsin-Madison and other locations. It includes the ability to poll participants as well as support open-ended discussions. It operates on a Univac 1108 computer.

- PLANET (United States, multisite, operational)
  Contact: Institute for the Future, 2740 Sand Hill Road, Menlo Park, CA 94025

  This system is the successor to the experimental FORUM program offered to selected ARPANET users in 1973. PLANET-1 was first introduced on TYMNET in 1974 and PLANET-2 was offered on TELENET in 1976. Both versions are assembly-language programs for PDP-10 computers. Users can perform selective reviews, save and submit text files, and send public, private, or anonymous meesages within any number of conferences. In addition, PLANET-2 allows voting and feedback of responses, including probability elicitation.

  An evaluation effort using monitor statistics and questionnaires is in progress under support from the National Science Foundation. FORUM and PLANET have been heavily used at NASA, ERDA, USGS, Kettering Foundation, and by groups in Europe. A version of this program is also in operation at Information Sciences Institute.

- RESOURCE INTERRUPTION MONITORING SYSTEM (RIMS) (United States, multisite, operational)
  Contact: Rich Scivetti, Crisis Management Division, Federal Office of Preparedness, GSA Building, 18th and F Streets, NW, Washington, DC 20405

  The computer conferencing systems developed by Murray Turoff are now a part of RIMS, a system for monitoring national crises (e.g., fuel availability). Ten regional centers are connected continuously and called into full operation during crisis periods. Also, analytic programs are available to provide further input to decisions.

AUDIO TELECONFERENCING SYSTEMS

BANK OF AMERICA (United States, two-site, operational)
Contact: Bank of America Center 555 California Street, San Francisco, CA 94104

Designed primarily for senior management use, this system places the participants in a "boardroom" environment, with a high-quality link between San Francisco and Los Angeles. The equipment is unobtrusive, and the system is highly successful, according to evaluations. It is used primarily for regularly scheduled meetings.

- DEPARTMENT OF COMMUNICATIONS (Canada, multisite, operational)
Contact: Communication Research Center, P.O. Box 11490, Shirley Bay, Station H, Ottawa, Ontario K2H 8S2, Canada

Six conference rooms are connected by this system, with four microphones in each room. Voice-switching is included, without speaker identification or wish-to-talk buttons. Some dissatisfaction with this system (first established in 1974 as an extension of an earlier point-to-point arrangement) can be traced to problems with the voice-switching.

- DEPARTMENT OF INDIAN AND NORTHERN AFFAIRS (Canada, multisite, operational)
Contact: Department of Indian and Northern Affairs, Ottawa, Canada

This organization uses a voice-switched system, with two microphones in each of the three conference rooms. All conferees can be simultaneously connected. The system has been reasonably successful although problems have occurred with the voice-switching. This system is significant as a response to the need for a substitute to uncomfortable winter travel in Canada and unreliable mail service.

- EDUCATIONAL TELEPHONE NETWORK (United States, multisite, operational)
Contact: Lorne Parker, Division of Educational Communications, University of Wisconsin-Extension, Madison, WI 53706

The Educational Telephone Network was initiated in 1965 to support remote teaching. It is a dedicated network which connects 200 locations. Each of these locations uses a Darome (Harvard, Illinois) Edu-Com portable, self-contained audio unit. These units consist of one large speaker and four

manually switched microphones. The cost of the system is said to be 25 cents per student contact hour, including rental of the telephone system and payment and maintenance of station equipment. Up to 25,000 students use the system per year.

- ENERGY RESEARCH AND DEVELOPMENT ADMINISTRATION (ERDA) (United States, multisite, operational)
  Contact: Jesse Pate, Division of Communications and Computer Operations, U.S. Energy Research and Development Administration, Washington, DC 20545

  Tested in the fall of 1976, this system operates from about 10 locations around the United States. Bell 50-A type equipment is used, along with facilities for sending facsimile copies. The system is available within ERDA on a dial-up basis.

- GENERAL SERVICES ADMINISTRATION (United States, multisite, operational)
  Contact: GSA Headquarters, 18th and F Streets, NW, Washington, DC 20405

  The GSA audio system was promoted as an outgrowth of the "energy crisis" and is used to connect the regional headquarters of the organization. Eleven locations are linked through Washington, DC, permitting multisite conferences or the system may be used directly when point-to-point communication is desired. Overhead microphones with voice-switching capabilities are used with the standard phone set. A muting button allows the conferees to have private conferences while still online.

- NATIONAL AERONAUTICS AND SPACE ADMINISTRATION (United States, multisite, operational)
  Contact: NASA Headquarters, 600 Independence Avenue, SE, Washington, DC 20003

  The NASA audio system now connects 18 rooms with the capability to add 15 more. Both portable 50-A units and structured conference rooms have been used since the Apollo project for conducting of technical meetings. Overhead microphones are provided; these are voice-switched and have "cough buttons." All centers also offer easy access to high-speed facsimile transmission. The use of the system is generally confined to management personnel for regularly scheduled meetings.

- QUEBEC AUDIO CONFERENCING SYSTEM (Canada, multisite, operational)
  Contact: Tele-Universite, 2875 Boulevard Laurier, Ste-Foy, Quebec G1V 2M3, Canada

  QUACS is an audio conferencing system which uses standard telephone equipment (50-A). Up to seven locations can be interconnected through a central

control system at any one time. In this arrangement, there are no special conference studios. The Bell 50-A sets can be connected anywhere. There are special conference circuits, however, operated from a console controlled by the university's telephone operator. The cost is $150 per conference.

Evaluation has been positive, indicating that audio conferences were shorter, more business-like, and more formal than face-to-face meetings. The system is now well established and is used routinely in the administration of the campus.

● TELECENTRE (France, multisite, operational)
Contact: Mr. B. Lefevre, 15 rue Chardon Lagache, 75016 Paris, France

This system began operation in Paris and is scheduled to be in 17 cities by the end of 1978. It includes facsimile service and a computer-controlled booking system for making reservations. Each Telecentre is designed for up to six participants and will include a "Telesecretariat" which will provide secretarial service remotely.

TELECOM-AUSTRALIA (Australia, multisite, experimental)
Contact: Telecom-Australia Research Labs, 59 Lt. Collins Street, Melbourne, Victoria 3000, Australia

This experimental audio conferencing arrangement uses an open microphone with some speakers transmitted at higher audio levels than the rest of the group. A minicomputer is used to signal which speaker has the floor with a green light next to the person's name; an orange light indicates who wishes to speak. In addition, the computer keeps usage statistics.

U.K. CIVIL SERVICE: REMOTE MEETING TABLE (Great Britain, two-site, operational)
Contact: Telecommunications Division, Civil Service Department, Riverwalk House, Millbank, London S.W.1., England

The U.K. Civil Service's RMT system began in 1972 as an outgrowth of experimentation by the Communications Studies Group. Presently, 11 sites are connected, with 7 studios in London and 1 each in Edinburgh, Glasgow, Manchester, and Norwich. A central site in London enables any pair of studios to be connected.

Each RMT unit has six microphones and seven loudspeakers, six of which "correspond" to the microphones on the distant RMT. Although all microphones at both RMTs are continuously open, all speech is switched to the loudspeaker representing the microphone from which the strongest signal emanates. The person who speaks loudest at each RMT is thereby identified; indicators on

the corresponding microphone and on the distant loudspeaker are illuminated. If no one is speaking sufficiently loudly, all speech is directed to the seventh loudspeaker (central) on the distant RMT.

RMTs are now being manufactured by Plessey; the Civil Service network is about to be extended, and other organizations are about to install terminals. Later versions manufactured by Plessey will permit multisite operation.

UNION TRUST COMPANY (United States, two-site, operational)
Contact: Union Trust Company, 300 Main Street, Stamford, CT 06901

In 1972, the New Rural Society Project, an organization funded by the Department of Housing and Urban Development, set up an experimental audio system between two branches of this Connecticut bank. Speakerphones, single-channel audio, multiple-channel audio, and stereo were tested. The stereo system was found to be the most effective. Each room seats 12 to 14 conferees, with plug-in microphones at the table. Graphic material is sent by facsimile transmission. The system costs about $400 per month to operate.

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